DUKANE

Intelligent Assembly Solutions

iQ Series

SERVO ULTRASONIC PRESS SYSTEMS

ES

AUTOMATED HAND PROBE PRESS

User's Manual

Press/Thruster Models:

- 43S215
- 43S220
- 43S245-AX
- 43S340

Dukane Part No. 403-578-01

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ISO 9001:2008 Dukane products are manufactured in ISO registered facilities.

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This user's manual documents product features, hardware, and controls software available at the time this user's manual was published.

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Revision History

Revision Number	Revision Summary	Date
- 00	Original release.	11/01/2012
- 01	Table 11-I, Page 127: Corrected Linear Encoder Resolution to microns (µm). Tables 3-III and 3-IV, Pages 28 and 29: Corrected Cable # 200-1556-XXM to J5.	08/25/2014

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SECTION 1

Introduction

General User Information 2
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General User Information

Read This Manual First

Before operating your ultrasonic system, read this User's Manual to become familiar with the equipment. This will ensure correct and safe operation. The manual is organized to allow you to learn how to safely operate this equipment. The examples given are chosen for their simplicity to illustrate basic operation concepts.

This manual provides information to set up, operate, and interface Dukane's ***iQ Series*** Servo ES presses.

Particular models are listed on the manual cover and in ***Section 11, Specifications***.

The manual consists of sections that describe in detail press specifications and functions, installation and testing procedures, and maintenance and troubleshooting steps. Each section describes press functions that are applicable to a standard press/thruster.

Notes, Cautions and Warnings

Throughout this manual we use NOTES to provide information that is important for the successful application and understanding of the product. A NOTE block is shown to the right.

In addition, we use special notices to make you aware of safety considerations. These are the CAUTION and WARNING blocks as shown here. They have important information that, if ignored, could have increasingly severe outcomes. These statements help you to identify and avoid hazards and recognize the consequences. One of three different symbols also accompany the CAUTION and WARNING blocks to indicate whether the notice pertains to a condition or practice, an electrical safety issue or an operator protection issue.

Drawings and Tables

The figures and tables are identified by the section number followed by a sequence number. The sequence number begins with one in each section. The figures and tables are numbered separately. The figures use Arabic sequence numbers (e.g. –1, –2, –3) while the tables use Roman sequence numerals (e.g. –I, –II, –III). As an example, Figure 3–2 would be the second illustration in section three while Table 3–II would be the second table in section three.

NOTE
Note statements provide additional information or highlight procedures.

CAUTION
Caution statements identify conditions or practices that could result in damage to the equipment or other property.

WARNING
Warning statements point out conditions or practices that could result in personal injury or loss of life.

Condition or Practice

Electrical Hazard

Hearing Protection

Press System Overview

An ***iQ Series*** Servo Ultrasonic Press System ES designates a variety of component combinations. These are generally grouped into two versions of the system based on how the servo electrical components are housed.

System Defined

A typical system consists of a press, generator, HMI (optional on some systems), an acoustic stack (transducer, booster, horn), fixturing, and cables. Control and data acquisition software is considered part of the system as well. Systems with A-Series generators (without a display) require the use of ***iQ Explorer*** software for operation. Systems with Q-Series generators (with a display) use ***iQ Explorer II*** software, which is not required for operation, but useful in process setup and data collection.

Versions Offered

Two press system configurations exist: remote and integrated.

Remote - This version consists of a press, generator, remote controller, and an HMI (optional on some systems). Most of the servo electronics are housed in the remote controller, with cable connections to the press and generator. Press models with this configuration are: 43S215 (15/20 kHz) and 43S245-AX (30/40 kHz).

Integrated - This version consists of a press, generator, and an HMI (optional on some systems). The servo electronics are integrated within the press. Press models with this configuration are: 43S220 (20 kHz) and 43S340 (30/40 kHz).

Other Resources

While this user's manual deals with the ***iQ*** Servo Press, other system components are covered in these publications:

iQ A-Series ES Generator (without display): 403-575

iQ Q-Series ES Generator (with display): 403-584

iQ Explorer software (for A-Series): 403-579

iQ Explorer II software (for Q-Series): 403-585

These user manuals can be downloaded from the Dukane website. Navigate to the manual you want using this path: ***www.dukane.com/us > Downloads > Manuals.***

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General Considerations

Safe Operation

Please observe these **health and safety recommendations** for safe, efficient, and injury-free operation of your equipment.

Proper Installation - Operate system components only after they are properly installed.

No Unauthorized Modifications - Do not modify your system in any way unless authorized to do so by Dukane Corporation. Unauthorized modifications could cause equipment damage and/or injury to the operator. In addition, unauthorized modifications will void equipment warranty.

Keep the Covers On - Do not remove any equipment cover unless directed to do so by Dukane Corporation.

Grounded Electrical Power - Operate this equipment only with a grounded electrical connection.

(See *Electrical Safety Grounding Instructions*, Page 10.)

Comply with Regulations - You may be required to add accessories to bring the system into compliance with applicable regulations (OSHA in the USA) for machine guarding and noise exposure.

Use Eye Protection - Wear ANSI approved safety impact goggles.

NOTE

These recommendations apply to the welding system. System in this manual refers to a complete group of components associated with the welding of parts, also known as an ultrasonic assembly system. A typical ***iQ Series*** System consists of the ***iQ*** generator, a press with thruster, switches, controls, cables, transducer, booster, horn, and fixture, and ***iQ Explorer II*** software.

WARNING

Any fixture manufactured by a third party must comply with all OSHA and ANSI requirements. All fixtures must be guarded as necessary.

Dukane Corporation does not assume any responsibility or liability for fixtures manufactured by the customer or any third party manufacturer.

WARNING

Never operate the generator with the cover off. This is an unsafe practice and may cause injury.

CAUTION

At some time you may be asked to remove equipment covers by the Dukane Service Dept. personnel. Before doing so, disconnect the system electrically from the incoming line AC power, including the generator, press, and remote controller (if present).

Continued

Continued from Previous Page

Safe Operation

Acoustic Stack Hazard - When an acoustic stack (transducer, booster, horn and tip) is energized by the ultrasound signal, it presents a potential hazard. Stay clear of an energized stack.

System Abort Switch - Install a system abort switch at each operator station when ultrasonic plastic assembly equipment is used with automatic material handling equipment in an automated system.

Foot Switch - Using a foot switch in place of the optical touch finger switches (operate switches) violates OSHA regulations.

Pre-trigger Absolute Distance Position - This positioning feature causes the horn to vibrate before contacting the part to be welded. To ensure safe operation, adjust this position so the ultrasound signal will not activate if the horn is more than ¼ in (7 mm) from the part to be welded.

System Electrical Cabling - Electrical power must be off when connecting or disconnecting electrical cables.

CAUTION

Parts being joined ultrasonically will at times vibrate at audible frequencies. Wear ear protectors to reduce annoying or uncomfortable sounds. In addition, ultrasound baffles, sound enclosures, or materials that absorb sound may be located to surround the system.

WARNING

Keep head, hands, limbs and body at least six inches (152 mm) away from an operating press/thruster. A vibrating, descending horn can cause burns and/or crushing injuries.

Continued

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Safe Operation

Do Not Wear Loose Clothing or Jewelry - Clothing or jewelry can become caught in moving parts.

Stay Alert - Watch what you are doing at all times. Use common sense. Do not operate the press when you are tired or distracted from the job at hand, or if bystanders are within reach of the press.

Effects of Medication - Your judgement or reflexes could be impaired while taking prescription medications. If so, do not operate the press. Be familiar with warning labels and recommended activity restrictions that accompany your prescription medications. If you have any doubt, do not operate the equipment.

Special Health Notice – Plastics

Certain plastic materials, when being processed, may emit fumes and/or gases that may be hazardous to the operator's health. Proper ventilation of the work station should be provided where such materials are processed. Inquiries should be made to the U.S. Department of Labor concerning OSHA regulations for a particular plastic prior to processing with Dukane ultrasonic equipment.

CAUTION

When making cable connections to system equipment or disconnecting cables from system equipment, make sure electrical power to the system is turned off, and AC power cords for each system component are removed from their receptacles. After the cables have been securely connected and the connections and cable routing checked a final time, the power may be restored.

Electrical Safety

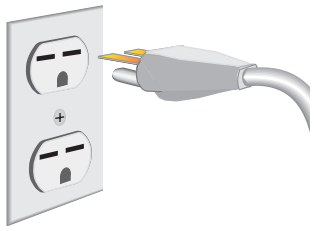
The ***iQ Series*** Servo Ultrasonic Press Systems ES have several electrically powered components including:

- ***iQ*** Generator,
- ***iQ*** Servo Press, and,
- Remote Controller (for applicable models).

Each of these components must be grounded, including power grounding and RFI suppression grounding.

Domestic Power Grounding

For safety, the power cords used with your system have three-wire, grounding-type power cords. Figure 2-1 illustrates the appropriate electrical outlet to use with the power cords that are included with systems shipped within North America.



Approved 2 pole, 3 wire grounding receptacle HUBBELL No. 5652 or equivalent to NEMA 6–15R or 6–20R

Figure 2-1 Example of 220/240 Volt, Grounded, 3-Prong Receptacle

CAUTION

If you have a two-prong electrical receptacle, we strongly recommend that you replace it with a properly grounded three-prong type. Have a qualified electrician replace it following the National Electric Code and any local codes and ordinances that apply.

See Figures 2-1 and 2-2.

CAUTION

If there is any question about the grounding of your receptacle, have it checked by a qualified electrician. Do not cut off the power cord grounding prong, or alter the plug in any way. If an extension cord is needed, use a three-wire cord that is in good condition. The cord should have an adequate power rating to do the job safely. It must be plugged into a grounded receptacle. Do not use a two-wire extension cord with this product.

Continued

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International Power Grounding

Power cables normally provided for international use are compatible with the power outlet used in many Continental European countries (Refer to Figure 2-2.) However, if your application requires another type of power cord, check with your equipment supplier, and follow local regulations concerning proper wiring and grounding.

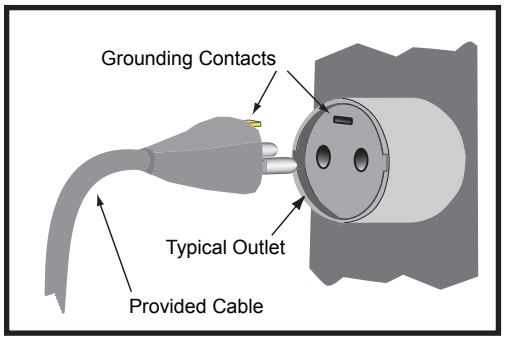


Figure 2-2 International 220/240V Grounding

Grounding for RFI Suppression

In addition to the safety considerations, proper grounding is essential for the effective suppression of RFI (Radio Frequency Interference). For instance, every generator contains an RFI filter which blocks noise on the AC power line from entering the generator control circuitry. This filter also prevents ultrasonic RFI from being fed back into the AC power line.

Grounding wires are shipped with each system component (green/yellow; 5 meters long; Dukane part number 200-1557). It is important to connect each of these wires to the nearest grounded metal pipe or equivalent earth ground by means of a ground clamp as shown in Figure 3-12. Note that the wires are connected using a 'star' configuration - do not 'daisy chain' the wires.

Operate Switches

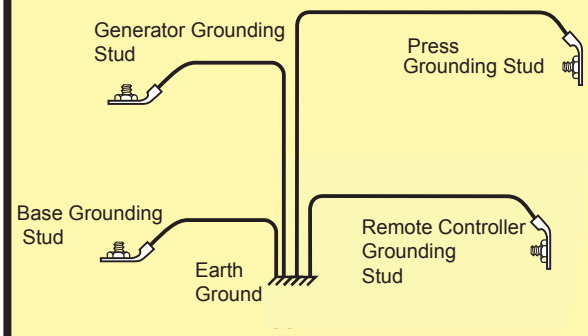
The optical operate switches on the press base comply with OSHA safety regulations.

Using a foot switch in place of these switches violates OSHA regulations.

CAUTION

To ensure safe and trouble–free operation, ground the generator, press, base, and remote controller.

Use a *STAR* configuration (illustrated below). Do not *DAISY CHAIN* the grounds.



Lifting the Equipment

How to Lift Safely

- Before lifting, take a moment to think about what you're about to do.
- Examine the object for sharp corners, slippery spots or other potential hazards. Know your limit and don't try to exceed it.
- Ask for help if needed, or if possible, divide the load to make it lighter.
- Know where you are going to set the item down, and make sure it and your path are free of obstructions. Then follow these steps:

    1. Stand close to the load with your feet spread apart about shoulder width, with one foot slightly in front of the other for balance.
    2. Squat down bending at the knees (not your waist). Tuck your chin while keeping your back as vertical as possible.
    3. Get a firm grasp of the object before beginning the lift. Begin slowly lifting with your LEGS by straightening them. Never twist your body during this step.
    4. Once the lift is complete, keep the object as close to the body as possible. As the load's center of gravity moves away from the body, there is a dramatic increase in stress to the lumbar region of the back.
    5. If you must turn while carrying the load, turn using your feet-not your torso. To place the object below the level of your waist, follow the same procedures in reverse order. Remember, keep your back as vertical as possible and bend at the knees.

CAUTION

Use a mechanical lift device to assist in safely lifting system components.

NOTE

Equipment weights are shown in ***Section 11 - Specifications***, Table 11-II.

NOTE

Several press models have a lifting eye bolt (at the top of the rigid column) for use with a mechanical hoist and lift hook. See the figure below.

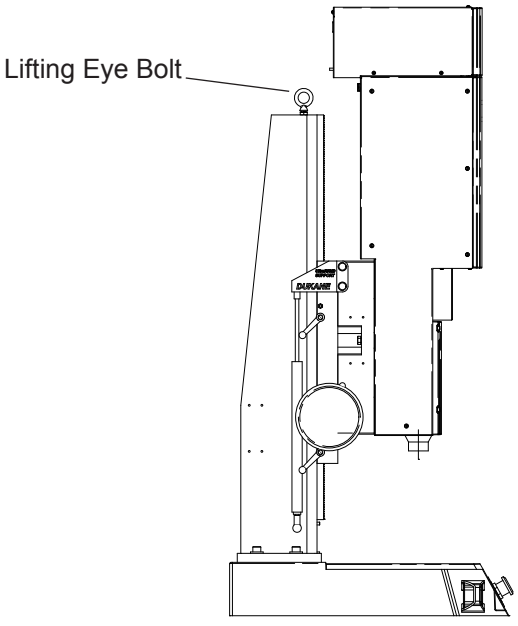


Figure 2-3 Lifting Eye Bolt on Some Press Models

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Before Installation

As you plan for the installation of your system, including generator and press, please consider these important subjects as listed below:

- When to use lockout / tagout devices
- Lifting the equipment safely - See ***Section 2 - Health and Safety***, Page 12
- Utilities
- Placement

When to Use Lockout / Tagout Devices

Figure 3-1 Lockout Device In Open Position, Unlocked

The typical kind of lockout/tagout (LOTO) device is a clam shell type device (with lockout capability). The LOTO device is placed over the plug end of the generator, press, and remote controller electrical cords. This effectively prevents access to the energy isolation points. See the example of one such device in the figure above.

The figure to the right shows the lockout device in the closed, locked position.

WARNING

Electrical safety hazards exist inside the generator, press, and remote controller units. Before making any internal adjustments to these components, apply a lockout/tagout (LOTO) device to each component.

Figure 3-2 Bottom Lockout Device In Closed Position, Locked

Continued

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Lockout/Tagout

Procedure to use BEFORE making any internal adjustments to the generator, press or remote controller units:

1. Push the unit's AC power switch/breaker to the OFF position.
2. Unplug the unit's electrical cord from its source.
3. Authorized personnel apply a lockout/tagout (LOTO) device to the plug end of the unit's electrical cord. Using a typical clam shell type LOTO device:
    1) Open the clam shell.
    2) Place the electrical cord plug end inside the shell.
    3) Close the shell.
    4) Secure the shell with its lock, and lock it.
4. Wait a minimum of five minutes for the unit to discharge its electrical energy.
5. After taking these steps, make the necessary adjustments to the unit.

Assuming the unit is being put back into service. . .

Procedure to use AFTER making any internal adjustments to the generator, press or remote controller units:

1. Authorized personnel remove the lockout/tagout device from the plug end of the unit's electrical cord. Using a typical clam shell type LOTO device:
    1) Unlock the protective shell.
    2) Open the shell, exposing the electrical cord end.
    3) Remove the LOTO device, and set it aside.
2. Plug the unit's electrical cord into its AC power source.
3. Push the unit's AC power switch/breaker to the ON position.

Utilities

Provide for electricity to meet the equipment specifications as shown in ***Section 11, Specifications***.

Transducer Cooling Air

Some welding applications may require compressed air to be used to cool the transducer, depending on the ultrasound power draw and ambient air temperature. The presses are equipped with tube fittings for connecting compressed air, which is routed to the transducer area inside the press. The air supply must be clean and dry. The pressure required is dependent on the application, with a maximum of 100 psi. (0.7 MPa). Fitting sizes are listed below for each press model:

43S215: 5/16" or 8 mm

43S220 and 43S340: 6 mm

43S245-AX: 1/4"

CAUTION

If transducer cooling air is used, this compressed air must be clean, dry and oil free. Any particulate, oil contamination or moisture can coat or clog the transducer. This can result in premature failure of the transducer.

Placement

Check that enough space has been set aside for the installation. Equipment dimensions are shown in ***Section 11, Specifications***.

In addition, take extra precautions when the installation is made in an active seismic region. See the recommendations for generator installation on the following two pages.

Placing the Generator when Used in an Active Seismic Region

If the ***iQ*** generator is to be used in an active seismic region, secure the unit by rack-mounting it or by securing the unit to a benchtop.

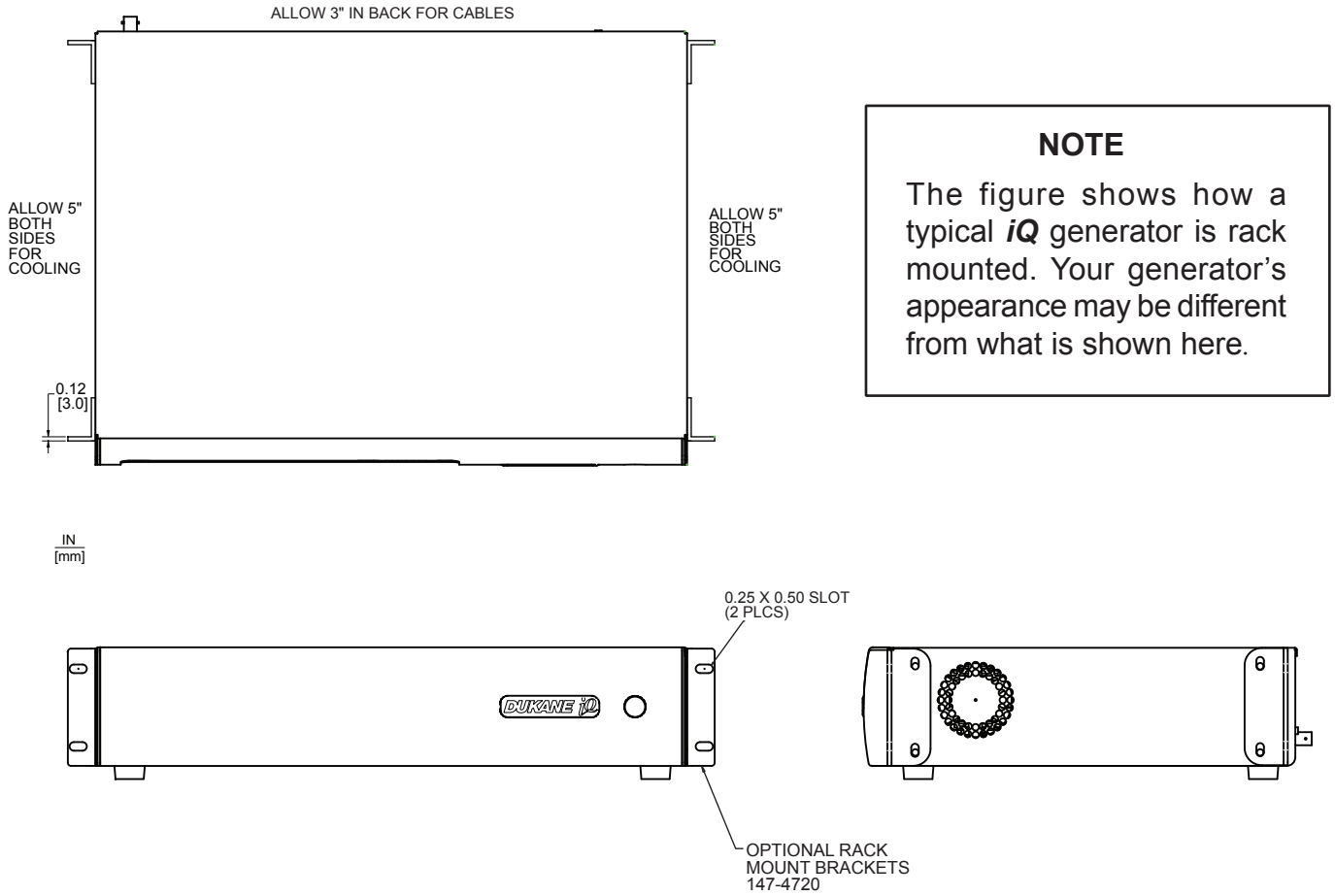
Rack-Mounting

Install the four brackets from Dukane's rack-mount kit to the generator. See Table 3-I, and Figure 3-3 (showing a low profile unit) below.

Mount the generator to a 19-inch equipment rack.

System Type	Dukane Part Number
High Profile	147-4721
Low Profile	147-4720

Table 3-I Rack Mount Bracket Part Numbers


ALLOW 3" IN BACK FOR CABLES
ALLOW 5" BOTH SIDES FOR COOLING
ALLOW 5" BOTH SIDES FOR COOLING
0.12 [3.0]
IN [mm]
0.25 X 0.50 SLOT (2 PLCS)
DUKANE iQ
OPTIONAL RACK MOUNT BRACKETS 147-4720

NOTE

The figure shows how a typical ***iQ*** generator is rack mounted. Your generator's appearance may be different from what is shown here.

Figure 3-3 Rack Mounting ***iQ*** Generator - Representative Low-Profile Model Shown

Continued

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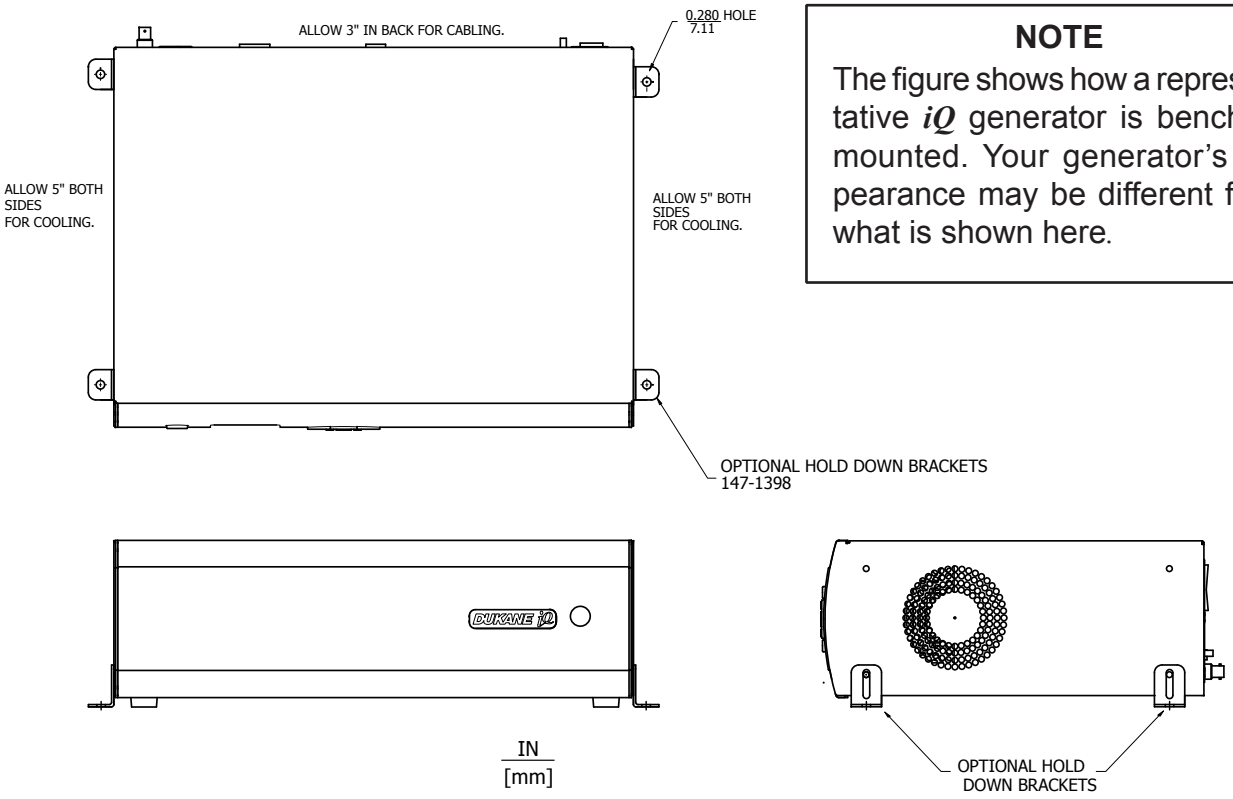
Benchtop Mounting

If you choose to mount the generator on a benchtop follow these instructions:

1. Install the four (4) optional hold down brackets (Dukane part number 147-1398). See Figure 3-4 below.
2. Secure one side of each L bracket to the generator's sheet metal cover.
3. Secure the other side of each L bracket to the bench itself.



NOTE

The figure shows how a representative ***iQ*** generator is benchtop mounted. Your generator's appearance may be different from what is shown here.

Figure 3-4 Securing ***iQ*** Generator to Benchtop - Representative High-Profile Model Shown

Unpacking the System

As mentioned, a typical ***iQ Series*** Servo Ultrasonic Press System ES consists of a press (thruster, ergonomic base and support package), generator, remote controller (on some models) and accessories (cables, software, etc.)

The system has been assembled and packaged at the factory for shipment. Depending on the system, there may be multiple crates or boxes to deal with.

Press

The press is secured to a wooden pallet and covered with a wooden crate. Components inside the crate are secured with metal bands, and with additional packing materials to give reinforcement when needed.

Before unpacking the press, take care and use mechanical assistance to move it close to the location where it will be installed.

1. Carefully remove the wooden crate from the base to expose the contents.
2. Remove the packing material, and temporarily set aside any other system components, leaving the press on the shipping base.
3. Inspect the assembly for any damage before placing it in position.

Put the Press in Place

Do not lift the press by hand. Use mechanical means to put the press into place.

To place the press on the work area, use a pallet lift platform. When the press has a lifting eye bolt (as seen in Figure 2-3, Page 12), use a hoist and lift hook.

Raise the assembly until the bottom edge of the base is even with the top of the work area as shown in Figure 3-5. Then, carefully slide the press system on to the work area.

CAUTION

DO NOT LIFT the press manually. Lifting and/or moving the press manually could result in personal injury. Use mechanical means to move and place the press.

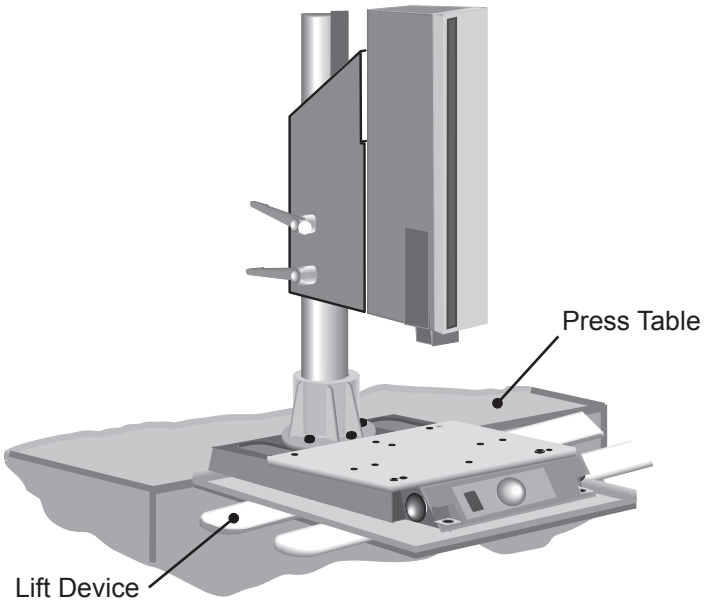


Figure 3-5 Example of Press Placement

Securing the Machine Base

In some cases there may be a need to secure the machine base to a work surface. The base has two 1/2" diameter holes provided to accept either 12mm or 7/16” diameter bolts for this purpose.

See the figure below showing base dimensions detail.

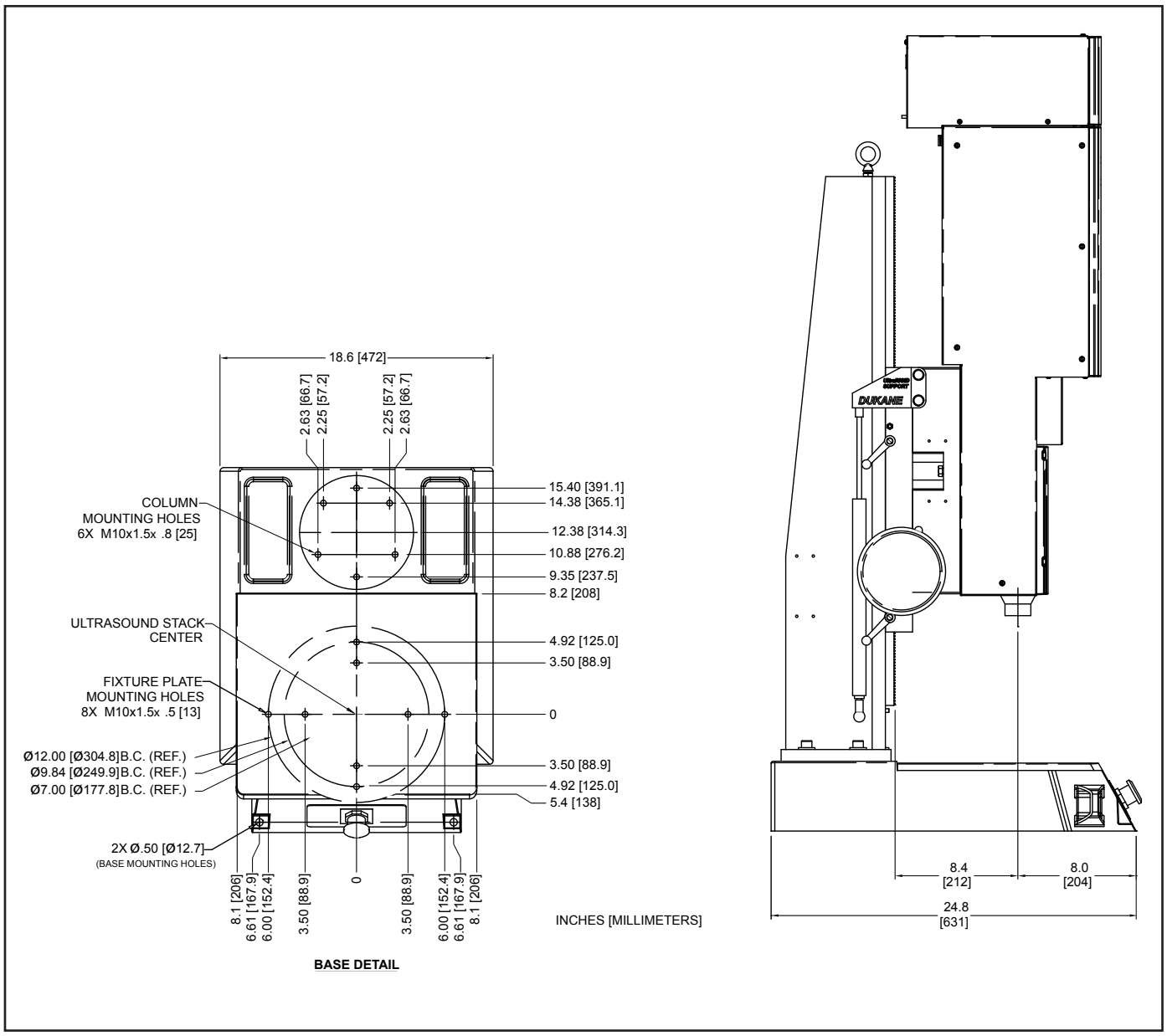


Figure 3-6 Base Dimensions Detail - For Reference Only

Installing the Press without Machine Base

In this configuration, secure the flange to a rigid, level, and stationary structure. We recommend socket-head cap screws M12 -1.75 with a minimum length of 50 mm for securing the flange to the supporting structure to achieve a minimum of 20mm thread engagement (the flange is 1 inch [25 mm] thick). Depending upon the thickness and material of the supporting structure, longer screws and/or additional hardware may be required.

A full scale template is provided for locating and drilling holes in the supporting structure.

The template is Figure 3-16 on Page 39.

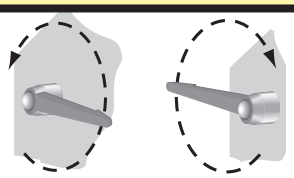
Press Height Adjustment

The height of the thruster on the column is adjustable. Adjustment is made by first finding the two height locking handles on the press. Figure 3-9 shows typical locations for these handles.

- To loosen the grip on the column, turn the handles counterclockwise, as shown in Figure 3-7a. The gas spring on the column supports the weight of the thruster while the handles are loose. If a thruster is not installed, the unloaded column may move upward unexpectedly, so be careful to avoid injury.
- Adjust the column to the desired height using the height adjustment wheel. See Figure 3-9.
- Turn the handles clockwise, as shown in Figure 3-7b, until tight.
- To rotate the handles out of the way without loosening or tightening, pull the handles outward, rotate and release, as shown in Figure 3-8.

CAUTION

Exercise caution if a thruster is not installed on the support housing. The gas spring on the unloaded housing may cause the assembly to move upward unexpectedly when the height locking handles are loosened.



(a) – Loosen **(b)** – Tighten

Figure 3-7 To Make Adjustments

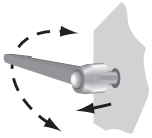


Figure 3-8 To Relocate Handles

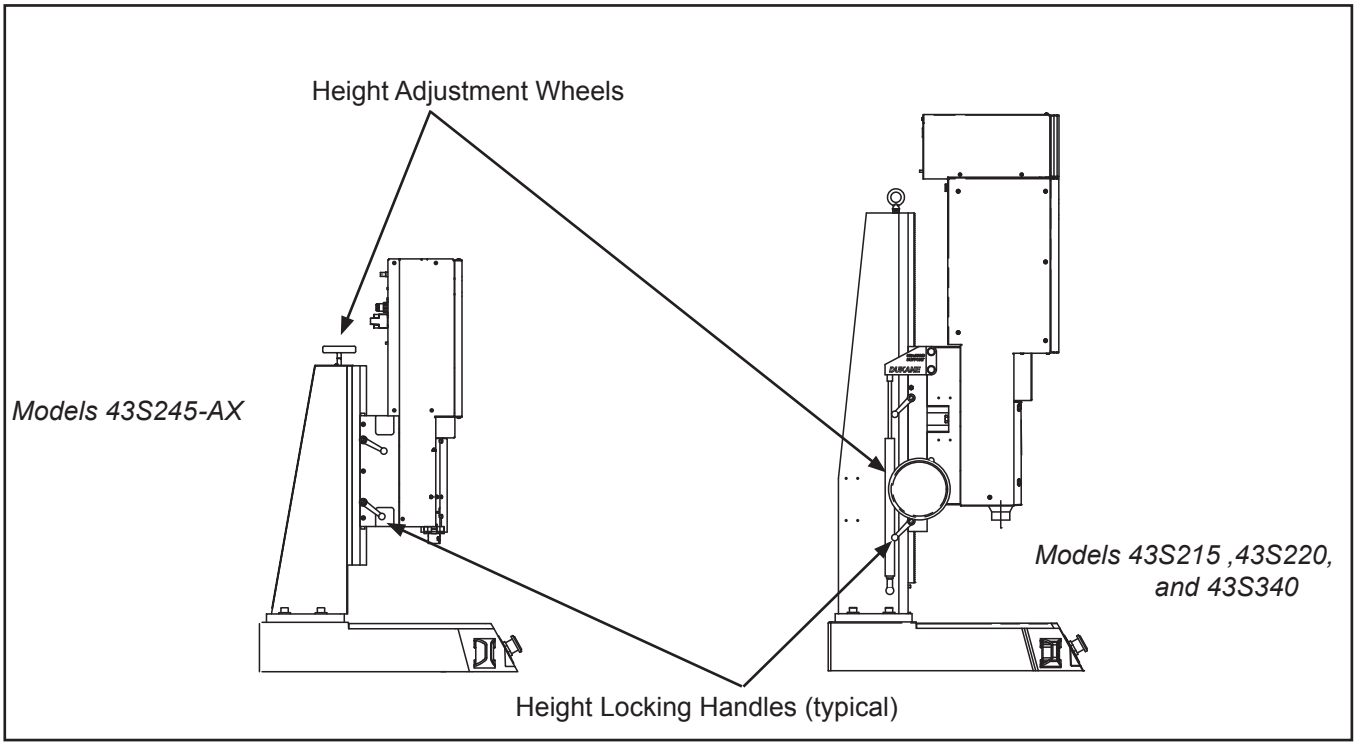


Figure 3-9 Height Adjustment Wheels and Locking Handles

Installing the Thruster

If the thruster unit is provided without a Dukane support, it should be mounted to a rigid, stationary structure as illustrated in the example shown in Figure 3-10. The mounting arrangement varies depending on the press model. Refer to the applicable layout drawings listed below for mounting information. It is critical to observe the maximum screw penetration specifications where indicated on the drawings; failure to do so may result in equipment damage.

When mounted to a Dukane column as in the press configuration, the height of the thruster is adjustable on the column. If the height of the thruster is not adjustable in your mounting arrangement, you must consider the distance from the horn tip to the work surface when determining the position of the thruster.

The distance between the tip of the retracted horn and the parts in the fixture must be less than the maximum travelling distance (stroke) of the thruster slide assembly. If the distance is greater, the horn will be unable to contact the parts during operation.

A shorter distance between the retracted horn tip and the parts in the fixture means a shorter travelling distance (stroke) during operation, which results in two advantages:

- A more stable thruster when applying pressure to the parts
- A shorter duty cycle for a faster production rate

However, it is important to ensure that there is sufficient room for the placement and removal of parts.

NOTE

Each installation presents its own set of conditions for the installer. The information offered here is a general guide to thruster installation.

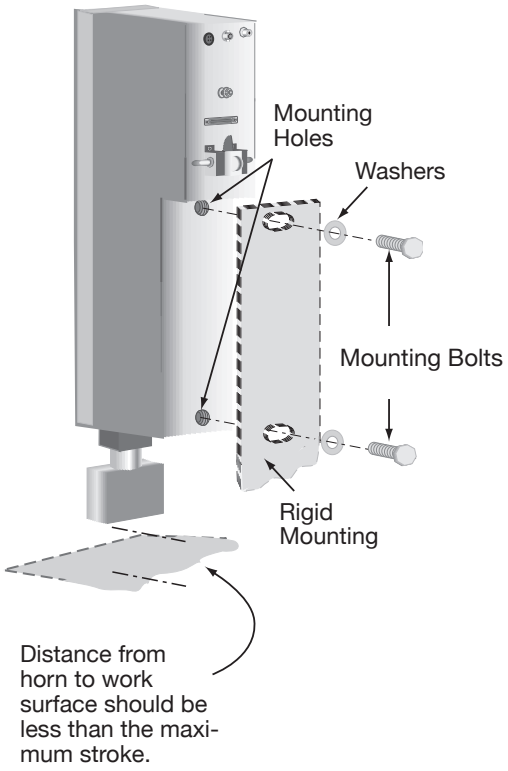

Mounting Holes
Washers
Mounting Bolts
Rigid Mounting
Distance from horn to work surface should be less than the maximum stroke.

Figure 3-10 Example of Mounting the Thruster to a Rigid Structure

NOTE

Thruster Drawings: See ***Section 11, Specifications*** for thruster drawings. The Dukane website is also a resource for the drawings. Go to *www.dukane.com/us>Downloads>Drawings / Layouts* and choose a thruster drawing based on your model number. See the table below.

Model	Thruster Dwg.No.
43S215	400-2321
43S220	400-2294
43S245-AX	400-2316
43S340	400-1978

Table 3-II Thruster Drawing Numbers

Connections for Thruster Only

Cable connections for systems without an ergonomic base are the same as for systems with a base shown in previous sections, with one exception. The cable normally connected to the base is replaced with an automation interface cable (Dukane part number 200-1546-XXM, where M is length in meters), which is connected between the generator J6 Base/Abort connector and the user-supplied automation equipment.

Cable Connections

The ***iQ*** Servo Presses are configured in one of two ways, depending on the model. Each has unique cabling requirements.

Version 1- Remote Controller Configuration

(Press Models: 43S215, 43S245-AX)

Typical Components:

- ***iQ*** Generator
- ***iQ*** Servo Press
- Remote Controller (contains servo electronics)
- HMI Interface (optional on some systems)
- Customer Automation Equipment

Connect the Cables

Use the following references as guides to making the connections:
For press model 43S215, use Figure 3-11 and Table 3-III.
For press models 43S245-AX, use Figure 3-11 and Table 3-IV.

1. Make the basic cable connections **1** through **9**, and **13-16**.
2. Make any optional connections.
3. Connect any customer-supplied equipment such as automation. Use cables **17** and **18** for automation.
4. Connect customer-supplied electricity using cables **10**, **11**, and **12**.

Connect the power cords last, but do not turn on the power yet.

5. Recheck all connections. When they are secure, you are ready to connect electrical power.
6. Finally, connect electrical power. See ***Section 11, Specifications*** for AC power requirements.

CAUTION

Before connecting or disconnecting cables: Put power switches for the ***iQ*** generator, press, remote controller, and any user-supplied automation equipment in the OFF position. Turn off electrical power. Remove AC power cords from their receptacles.

NOTE

Some connectors have a pair of threaded jack screws to secure the connector. Make sure the screws are snug, but do not overtighten them.

CAUTION

DO NOT operate the generator unless the ultrasound coaxial cable is connected and the transducer is installed in the thruster. Otherwise, an overload condition could occur, with possible damage to the generator.

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Servo Press/Thruster (Version 1)

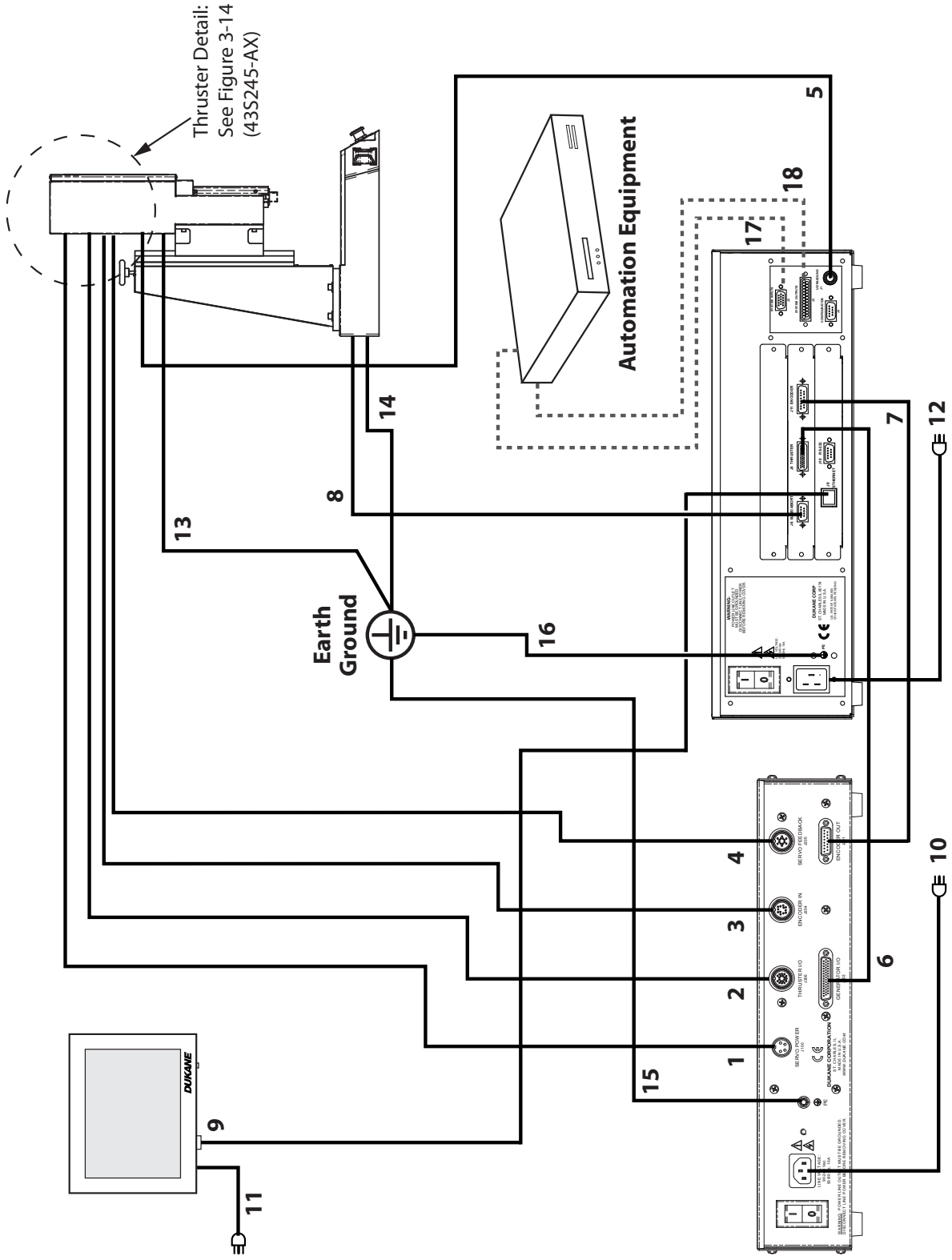

Figure 3-11 *iQ* Generator, Remote Controller, and Servo Press/Thruster - Connections Diagram

Continued

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Servo Press/Thruster (Version 1)

Cable No.	Part Number	Length (meters)	Connections				
			Generator	Base	Thruster	Remote Controller	HMI
1	200-1655-XXM	XX	-	-	SERVO POWER	J100	-
2	200-1647-XXM	XX	-	-	THRUSTER I/O	J206	-
3	200-1648-XXM	XX	-	-	ENCODER	J204	-
4	200-1649-XXM	XX	-	-	SERVO FEEDBACK	J205	-
5	200-1289-XXM	XX	J1	-	ULTRASOUND	-	-
6	200-1556-XXM	XX	J5	-	-	J202	-
7	200-1613-XXM	XX	J11	-	-	J201	-
8	200-1545-XXM	XX	J6	J35	-	-	-
9	200-1553-XXM	XX	J9	-	-	-	ETHERNET
10	One of the following: 200-1110 (240 VAC, 15A, US) 200-1111 (240 VAC, 16A, Europe) 200-1612 (240 VAC, 15A, India)	2.4	-	-	-	AC INPUT	-
11	One of the following: 200-1541 (240 VAC, 10A, US) 200-1542 (240 VAC, 10A, Europe) 200-1624 (240 VAC, 10A, India) 200-1576 (120 VAC)	2.4	-	-	-	-	AC INPUT
12	(Power cord is integral to generator,)	2.4	AC INPUT	-	-	-	-
13	200-1557	5	-	-	PE	-	-
14	200-1557	5	-	GRND	-	-	-
15	200-1557	5	-	-	-	PE	-
16	200-1557	5	PE	-	-	-	-
17	200-1380-XXM	XX	J2	-	-	-	-
18	200-1381-XXM	XX	J3	-	-	-	-

Table 3-III *iQ* Generator, Remote Controller, and Servo Press/Thruster Cables for Press Model 43S215

Continued

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Servo Press/Thruster (Version 1)

Cable No.	Part Number	Length (meters)	Connections				
			Generator	Base	Thruster	Remote Controller	HMI
1	200-1646-XXM	XX	-	-	SERVO POWER	J100	-
2	200-1647-XXM	XX	-	-	THRUSTER I/O	J206	-
3	200-1648-XXM	XX	-	-	ENCODER	J204	-
4	200-1649-XXM	XX	-	-	SERVO FEEDBACK	J205	-
5	200-479-XXM	XX	J1	-	ULTRASOUND	-	-
6	200-1556-XXM	XX	J5	-	-	J202	-
7	200-1613-XXM	XX	J11	-	-	J201	-
8	200-1545-XXM	XX	J6	J35	-	-	-
9	200-1553-XXM	XX	J9	-	-	-	ETHERNET
10	One of the following: 200-1541 (240 VAC, 10A, US) 200-1542 (240 VAC, 10A, Europe) 200-1624 (240 VAC, 10A, India) 200-1576 (120 VAC)	2.4	-	-	-	AC INPUT	-
11	One of the following: 200-1541 (240 VAC, 10A, US) 200-1542 (240 VAC, 10A, Europe) 200-1624 (240 VAC, 10A, India) 200-1576 (120 VAC)	2.4	-	-	-	-	AC INPUT
12	One of the following: 200-1110 (240 VAC, 15A, US) 200-1111 (240 VAC, 16A, Europe) 200-1612 (240 VAC, 15A, India) 200-1541 (240 VAC, 10A, US) 200-1542 (240 VAC, 10A, Europe) 200-1624 (240 VAC, 10A, India) (for 120 VAC models, power cord is integral to generator)	2.4	AC INPUT	-	-	-	-
13	200-1557	5	-	-	PE	-	-
14	200-1557	5	-	GRND	-	-	-
15	200-1557	5	-	-	-	PE	-
16	200-1557	5	PE	-	-	-	-
17	200-1380-XXM	XX	J2	-	-	-	-
18	200-1381-XXM	XX	J3	-	-	-	-

Table 3-IV *iQ* Generator, Remote Controller, and Servo Press/Thruster Cables for Press Models 43S245-AX

Cable Connections Continued

Version 2 - Integrated Configuration

(Press Models: 43S220, 43S340)

Typical Components:

- ***iQ*** Generator
- ***iQ*** Servo Press with Integrated Servo Electronics
- HMI Interface (optional on some models)
- Customer Automation Equipment

Connect the Cables

Use Figure 3-12 and Table 3-V as guides to making the connections.

1. Make the basic cable connections **2** through **6**, and **9-11**.
2. Make any optional connections.
3. Connect any customer-supplied equipment such as automation. Use cables **12** and **13** for automation.
4. Connect customer-supplied electricity using cables **1**, **7**, and **8**.

Read and follow the NOTE about cable layout to the right.

Connect the power cords last, but do not turn on the power yet.

5. Recheck all connections. When they are secure, you are ready to connect electrical power.
6. Finally, connect electrical power. See ***Section 11, Specifications*** for AC power requirements.

CAUTION

Before connecting or disconnecting cables: Put power switches for the ***iQ*** generator, press and any user-supplied automation equipment in the OFF position. Turn off electrical power. Remove AC power cords from their receptacles.

NOTE

Arrange the cable layout so that cable 1 is physically separated from other cables connected to the thruster (see Figure 3-12). Do not bundle cables 1, 7, or 8 with any other cables.

CAUTION

DO NOT operate the generator unless the ultrasound coaxial cable is connected and the transducer is installed in the thruster. Otherwise, an overload condition could occur, with possible damage to the generator.

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Servo Press/Thruster (Version 2)

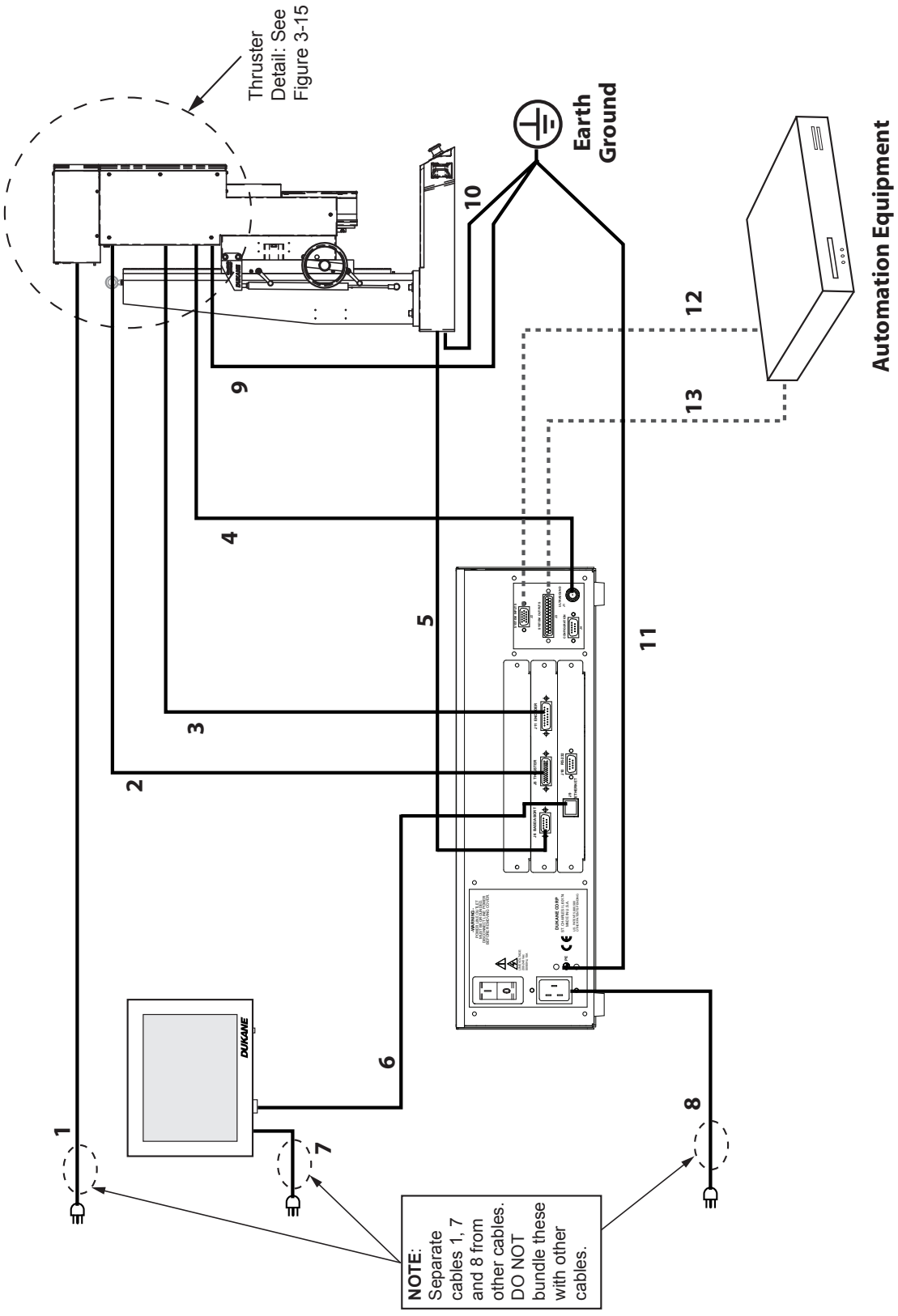

Figure 3-12 *iQ* Generator and Servo Press/Thruster - Connections Diagram

Continued

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Servo Press/Thruster (Version 2)

Cable No.	Part Number	Length (meters)	Connections			
			Generator	Base	Thruster	HMI
1	One of the following: 200-1541 (240 VAC, 10A, US) 200-1542 (240 VAC, 10A, Europe) 200-1624 (240 VAC, 10A, India) 200-1576 (120 VAC)	2.4	-	-	AC INPUT	-
2	200-1556-XXM	XX	J5	-	THRUSTER I/O	-
3	200-1613-XXM	XX	J11	-	ENCODER	-
4	200-479-XXM	XX	J1	-	ULTRASOUND	-
5	200-1545-XXM	XX	J6	J35	-	-
6	200-1553-XXM	XX	J9	-	-	ETHERNET
7	One of the following: 200-1541 (240 VAC, 10A, US) 200-1542 (240 VAC, 10A, Europe) 200-1624 (240 VAC, 10A, India) 200-1576 (120 VAC)	2.4	-	-	-	AC INPUT
8	One of the following: 200-1110 (240 VAC, 15A, US) 200-1111 (240 VAC, 16A, Europe) 200-1612 (240 VAC, 15A, India) 200-1541 (240 VAC, 10A, US) 200-1542 (240 VAC, 10A, Europe) 200-1624 (240 VAC, 10A, India) (for 120 VAC, 3600 W, or 4800 W models, power cord is integral to generator)	2.4	AC INPUT	-	-	-
9	200-1557	5	-	-	PE	-
10	200-1557	5	-	GRND	-	-
11	200-1557	5	PE	-	-	-
12	200-1380-XXM	XX	J2	-	-	-
13	200-1381-XXM	XX	J3	-	-	-

Table 3-V *iQ* Generator and Servo Press/Thruster Cables

Connector Descriptions

Brief descriptions are given grouped by the press component that has the connector being discussed.

iQ Generator Connectors

J1 - Ultrasound Output Connector

The ultrasound output connector used with all standard generators is a high voltage (5000V) coaxial style SHV-BNC connector. This connector provides superior shielding of electrical noise, compared to other types of connectors. The ultrasound output connector mates with fully shielded coaxial ultrasound cables that are secured with a simple and reliable quarter-turn bayonet style attachment mechanism.

J2 - System Inputs Connector

The SYSTEM INPUTS connector includes connections for all of the basic system control input signals that will typically come from an automated control system. The cable attached to this connector includes all of the available system control signals, which will be controlled by an output card or output port on the automation controller.

The user can determine which signals to use for each particular welding application, but there must be at least one connection to this connector in order to activate the ultrasound output.

J3 - System Outputs Connector

The SYSTEM OUTPUTS connector includes connections for all of the basic system status and monitor output signals, which will typically connect to an automated control system. The cable attached to this connector includes all of the available system output signals, which will be read or monitored by a digital input card or analog inputs on the user-supplied automation controller.

The user can determine which signals are appropriate for each welding application**.**

NOTE

For details on integrating the welder with automation, refer to Application Note AN507 (Automation Interface Guidelines) at *www.dukane.com/us* > *Downloads* > *Application Notes*.

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J4 - Configuration Port Connector

The configuration port connector is a DB-9M (standard D-subminiature 9 circuit male) typically used for RS-232 serial communications. This serial port (DTE) connects to a serial port (DCE) on a computer via a standard 9-pin serial cable. If the computer does not have a serial port, you may use a USB-to-serial conversion cable.

This port is used for field updates to the generator firmware, without removing the enclosure cover. This port can also be used with a software application running on a Windows PC to modify the factory default system settings and hardware configurations. Contact your local sales representative for software availability information and access to documentation that will allow you to make use of the configuration port features.

J6 - Base/Abort

The Base/Abort connector accepts the operate and emergency stop signals from the optical operate switches and abort switch on the base. If you are using custom automation, you may have separate operate and abort switches, but these still connect to this connector on the generator.

J9 - Ethernet

This port is used for Ethernet communication between the generator and HMI running ***iQ Explorer*** or ***iQ Explorer II*** software.

J10 - RS-232

This port is primarily used for welder diagnostic functions accessible via serial communication to a PC. Guidance will be provided by Dukane if the need to use the capability arises.

J11 - Encoder

This connector accepts signals from the distance encoder on the press.

J5 – Thruster

This connector is used to interface various control signals between the press and generator.

Thruster Connectors

Thruster I/O

This connector is used to interface various control signals between the generator and press.

Encoder

This connector contains signals from the distance encoder that are routed to the generator.

Ultrasound

This connector receives the ultrasound cable from the generator's J1 port.

Top of Stroke (Optional)

Some press models are equipped with this connector, which provides a signal indicating when the press is in the Top of Stroke (fully retracted) position. This signal is typically used in automated systems to indicate to the controlling mechanism (supplied by the end user) when the slide assembly is fully retracted.

Although the Top of Stroke signal is provided on some presses, it is available as a digital output on the generator (connector J3) for all press models. The use of this generator output rather than press signal is recommended for greater long-term reliability.

J35 - Ergonomic Base Connector

This connector is used to interface the base controls and display to the Base/Abort connector (J6) on the generator. See Figure 3-13 for the location of the base connector.

NOTE

The Top of Stroke connector on the press is limited to 24 VDC @ 2 Amps.

Remote Controller Connectors

The remote controller works with the ***iQ*** generator to:

- provide power for the servo actuator,
- send control outputs to and receive inputs from the servo actuator, and
- receive inputs from and send outputs to the ***iQ*** generator.

J100 - Servo Power

Power for the servo actuator is fed through the cable that connects to SERVO POWER on the thruster.

J202 - Servo I/O

This connector mates with an Inputs/Outputs cable that carries signals between the remote controller and the ***iQ*** generator.

J204 - Encoder In

Signals from the thruster's distance encoder are fed to this connector on the remote controller.

J205 - Servo Feedback

Feedback from the servo actuator is transmitted to the remote controller through this connector.

J206 - Thruster I/O

Inputs and outputs between the thruster and the remote controller are transmitted through this connector.

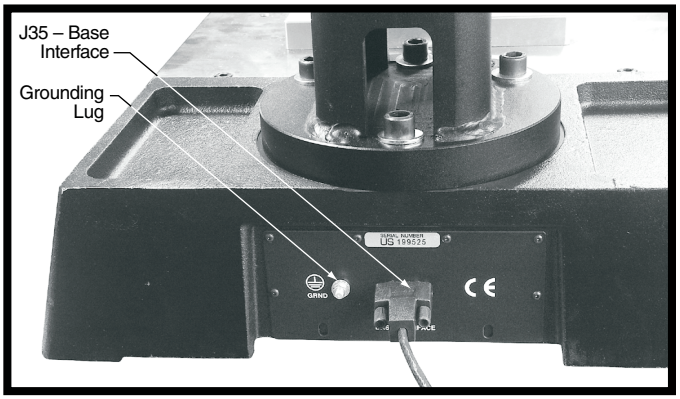

Figure 3-13 Rear of Press Base Showing J35 and Grounding Lug

Continued

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NOTE

Circled numbers correspond to cables shown in:
Table 3-III for Model 43S215, and in
Table 3-IV for Models 43S245-AX.

CAUTION

If transducer cooling air is used, this compressed air must be clean, dry and oil free. Any particulate, oil contamination or moisture can coat or clog the transducer. This can result in premature failure of the transducer. Air pressure is determined by the application, transducer power draw and ambient air temperature.

Figure 3-14 *iQ* Servo Press/Thruster Rear Cable Connectors - Version 1, Models 43S245-AX
(**NOTE**: Version 1, Model 43S215 has a similar rear panel.)

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NOTE

Circled numbers correspond to cables shown in Table 3-V.

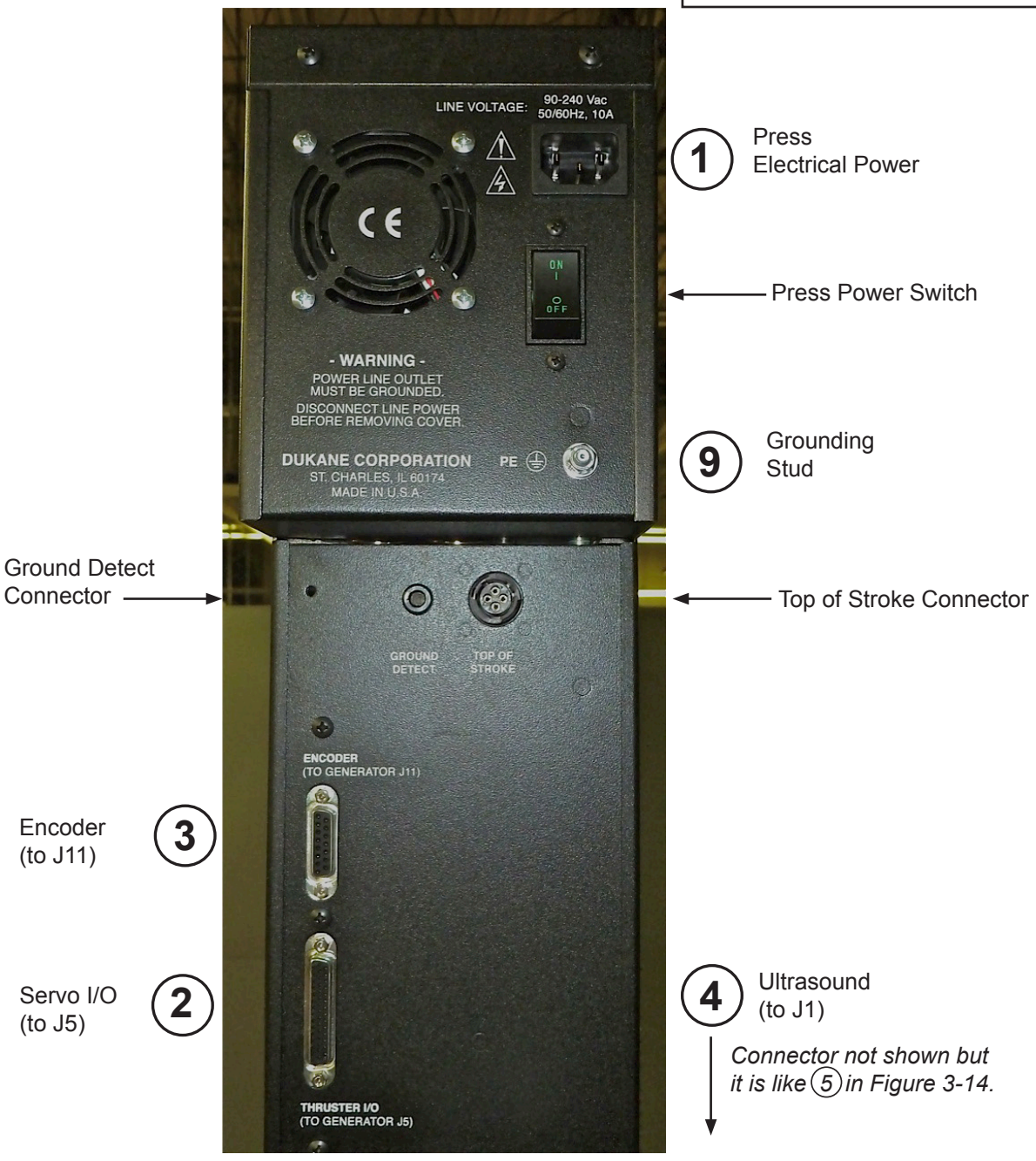

Figure 3-15 *iQ* Servo Press/Thruster Rear Cable Connectors - Version 2, Model 43S220 and 43S340

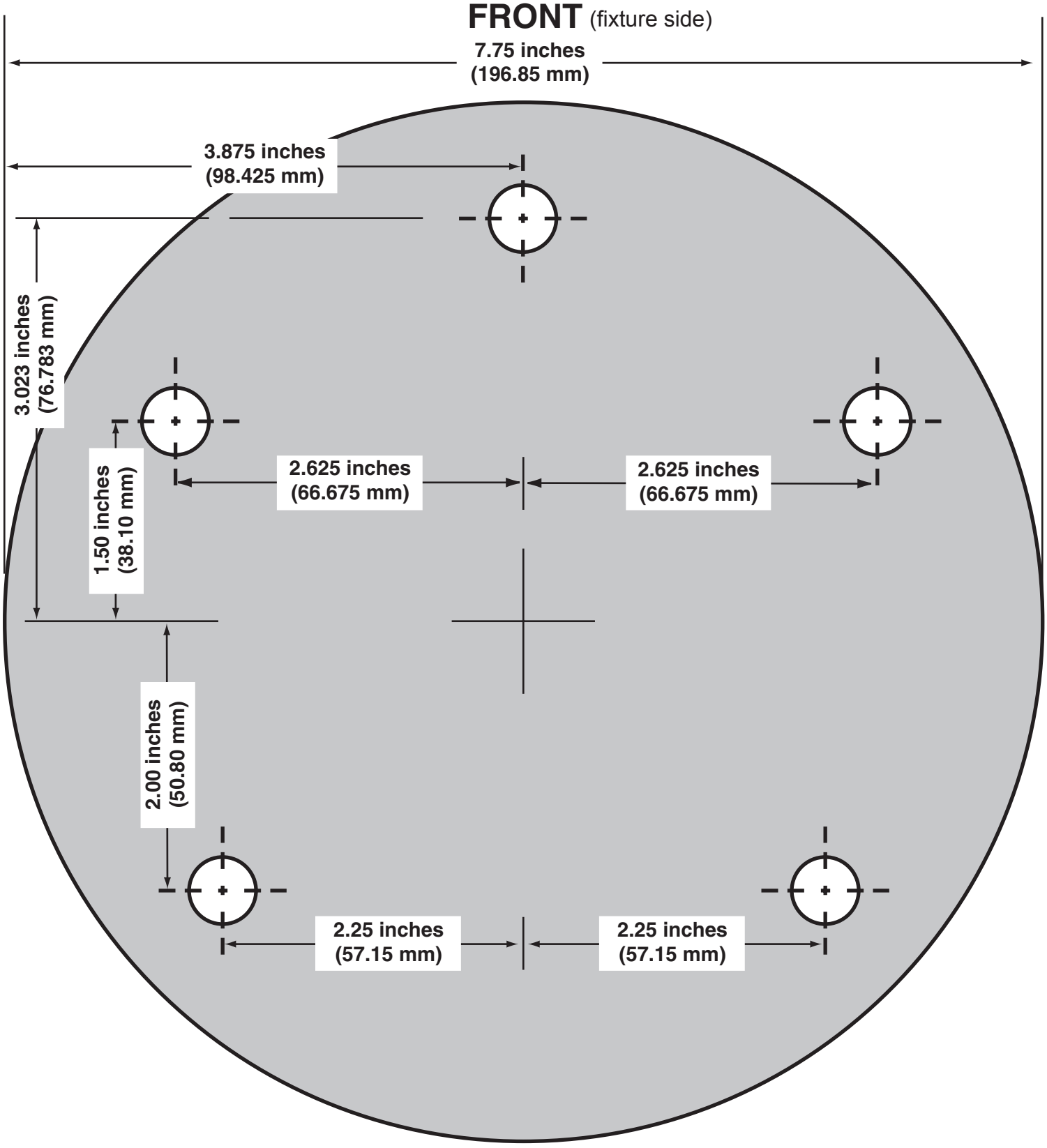

Figure 3-16 Flange Template

No Scaling - Actual Size

Flange Template

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SECTION 4

Acoustic Stack/Fixture Setup

Overview 43
Stack Description 44
Changing Stack Components 45
Stack Removal 45
Stack Disassembly 46
Removing a Detachable Tip 46
Stack Assembly and Torque Values 47
Installing a Detachable Tip 48
Fixture Installation 49
Fixture Alignment 49
Adjusting the Travel Limit (Electronic Bottom Stop). . . .50
Fixture Leveling 51

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Overview

A Dukane press/thruster and an ***iQ Series*** generator can be used to assemble an unlimited variety of parts for every conceivable market segment, including automotive, medical, appliance, consumer, packaging and toy industries. Various techniques and processes, such as welding, staking, swaging, inserting, and spot welding can be used for the different applications.

This variety is made possible through the interchange of some system components. Of these components, the horn and fixture are usually custom-made for each application, and the booster that is selected for a job depends on the required horn output amplitude. Also, the press/thruster controls are specifically adjusted for each application.

This section provides instructions for setting up these components of the system in a new installation or when changing applications.

Stack Description

The acoustic stack shown in Figure 4-1 consists of three parts:

- Transducer
- Booster
- Horn

The transducer and the booster are normally shipped assembled and installed in the press. The horn and/or the fixture may be shipped separately.

The stack is easily removed from or installed in the press/thruster. This makes it possible to change the horn or booster. It also makes it easier to perform regular inspections and/or maintenance of the stack components.

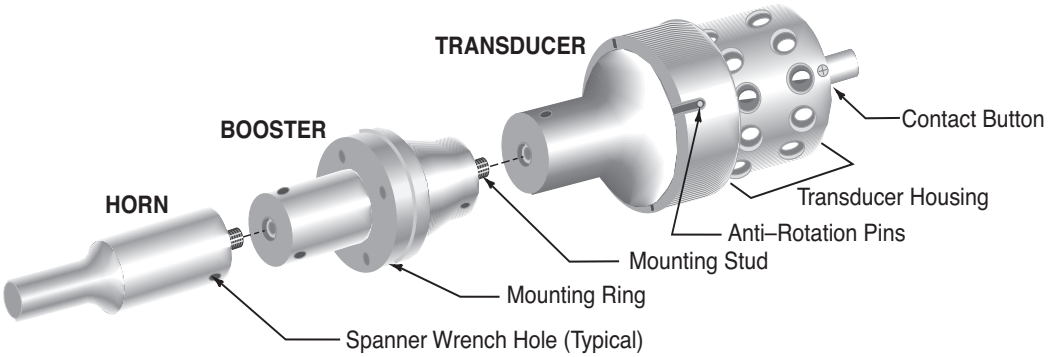

Figure 4-1 Acoustic Stack Components

Changing Stack Components

Stack Removal

Before removing the stack, perform the following steps:

1. Activate the E-STOP (Abort) switch on the front of the press base.
2. Power down the generator.

These two steps are necessary to ensure that no power will be accidently applied while removing the stack.

3. While supporting the stack with one hand, loosen the two or four socket-head screws that secure the stack access door.
4. If the door has two screws, swing it open. If it has four screws, remove it completely.
5. Pull the stack forward and down until the transducer clears the electrical contact. Refer to Figure 4-2.
6. Lift the stack out of the housing.

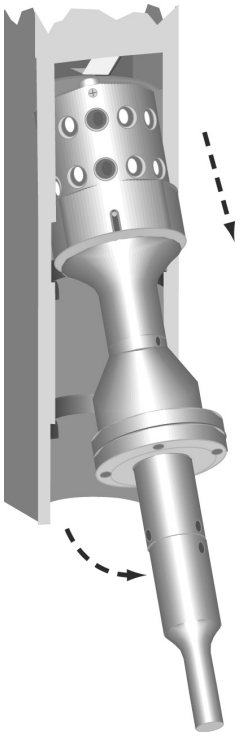

Figure 4-2 Stack Removal

CAUTION

The stack access door on the press/thruster holds the stack components in the stack housing. Hold the stack by the HORN or the exposed part of the BOOSTER when removing or installing the access door. This will prevent the stack from falling out and being damaged.

NOTE

When changing or inspecting any of the stack components, ALWAYS remove the stack from the thruster.

CAUTION

There may be an electrical charge stored in the transducer. To avoid any electrical shock, do not touch the contact button when removing the stack.

Stack Disassembly

To separate the stack components carefully follow the instructions below:

1. Use the two spanner wrenches (wrench A and B) provided with the press. Place wrench A on the component to be removed (Figure 4-3) and wrench B on the adjoining component. Turn wrench A in the direction indicated.

   Once the component is loose, it can be removed by hand.

2. To maintain structural integrity, NEVER hold a transducer by the housing or the booster by the mounting rings while separating components. Doing so will result in damage to the unit.

3. Use only the tools recommended by Dukane. NEVER clamp a horn, booster, or transducer in a vise or use tools such as pliers, visegrips, etc. Doing so will result in scratches and/or gouges, resulting in stress areas on the surface. This condition will affect the stack operation and could lead to failure of each stack component.

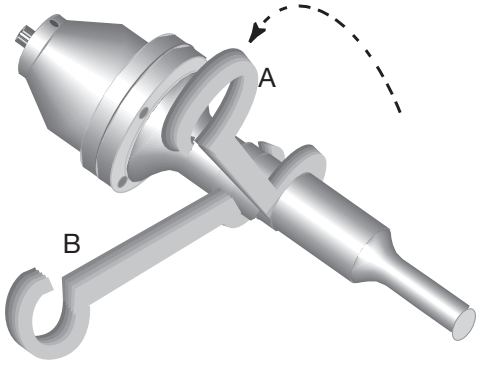

Figure 4-3 Disassembling Components

CAUTION

To avoid possible injury, press down on the spanner wrench with the palm of the hand.

Removing a Detachable Tip

If the horn has a detachable tip, do the following:

1. Use a spanner wrench to hold the horn, as shown in Figure 4-4.

2. Turn a properly sized open end wrench to loosen the tip.

NEVER clamp the horn or use a vise to hold it.

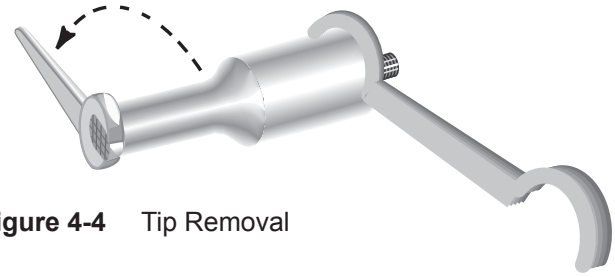

Figure 4-4 Tip Removal

Stack Assembly

Before assembling a stack, inspect all of the components for possible damage — especially the surfaces that are to be joined. Look for non-flat surfaces (concave, convex), stress cracks, chips, or gouges. Any of these irregularities will affect the operation of the stack and could cause further damage. Contact the Dukane Ultrasonics Tooling Department concerning a damaged component.

When the components have been inspected and are found to be free of any damage, continue with the following steps:

1. Inspect the contact surfaces for smoothness and cleanliness. Pitting or a buildup of old grease and dirt on the surface will interfere with the transfer of energy from one component to another.
2. Remove any foreign matter from the threaded stud and the mating hole. Tighten the stud in the stack component that is most distant from the transducer according to the following stud torque values:

Stud Thread Size	Torque		
	inch-lbs	foot-lbs	Nt-meters
1/2 in. x 20	12-18	1 - 1.5	1.4 - 2
3/8 in. x 24	12-18	1 - 1.5	1.4 - 2
M8 x 1.25	12-18	1 - 1.5	1.4 - 2

Table 4-I Stud Torque Values

3. Coat one of the contact surfaces with a thin coat of high-pressure grease. A small packet is supplied with the system. We recommend Dow–Corning #4 (or #111 as an alternate).
4. Thread the components together and tighten (Refer to Table 4-II) by applying torque as follows:

Stack kHz	Torque		
	inch-lbs	foot-lbs	Nt-meters
15	540	45	61
** 20	420	35	47.5
20	300	25	34
30	216	18	24.4
40	216	18	24.4

Table 4-II Horn/Booster Torque Values

** 20 kHz 43S245, 43Q245 models. *These models have 3/8 inch x 24 tpi studs. Often a step stud may be required to assemble the 20 kHz horn to its booster.*

NOTE

Do not apply any grease or lubricant to the stud.

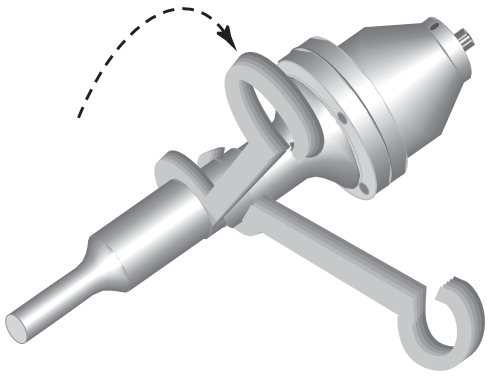

Figure 4-5 Assembling Components

Installing a Detachable Tip

If the horn has a detachable tip, do the following:

1. Inspect the surfaces of the tip and the horn for any stress cracks, chips or gouges.

2. Coat one of the contact surfaces with a thin coat of high-pressure grease or lubricant. We recommend Dow–Corning #4 (or #111 as an alternate).

3. Thread the tip into the horn. To tighten the tip, use the open-end wrench for the tip and a spanner wrench to hold the horn, as shown in Figure 4-6.

   Tighten the tip to the following specifications:

Tip Stud Thread Size	Torque		
	inch-lbs	foot-lbs	Nt-meters
1/2 in. x 20	360	30	40.7
3/8 in. x 24	336	28	37.9
5/16 in. x 24	300	25	33.9
1/4 in. x 28	240	20	27.1

Table 4-III Replaceable Tip Torque Values

Installing the Stack

1. Ensure that the generator power is off.

2. With the stack at the angle shown in Figure 4-7, rest the booster mounting ring on the block or pin of the stack housing.

3. Brace the stack at point **A** in Figure 4-7, and swing the stack to a vertical position. The ultrasound contact button on the transducer should snap under the electrical contact leaf of the housing.

4. While still supporting the stack in this vertical position, install or swing closed the stack access door, and thread the two or four socket-head screws (that hold the door closed) into their holes.

5. If the horn is not properly aligned with the fixture, rotate the stack to align the horn with the fixture.

6. Finish tightening the socket head screws until snug.

   DO NOT OVER-TIGHTEN!

NOTE

Do not apply any lubricant to the tip threads.

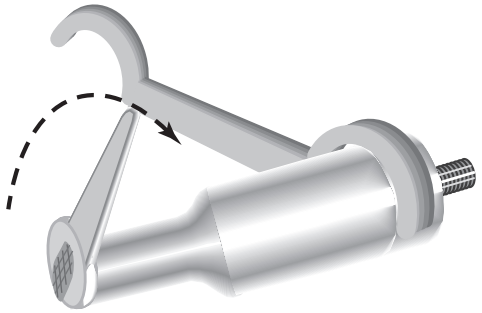

Figure 4-6 Tip Assembly

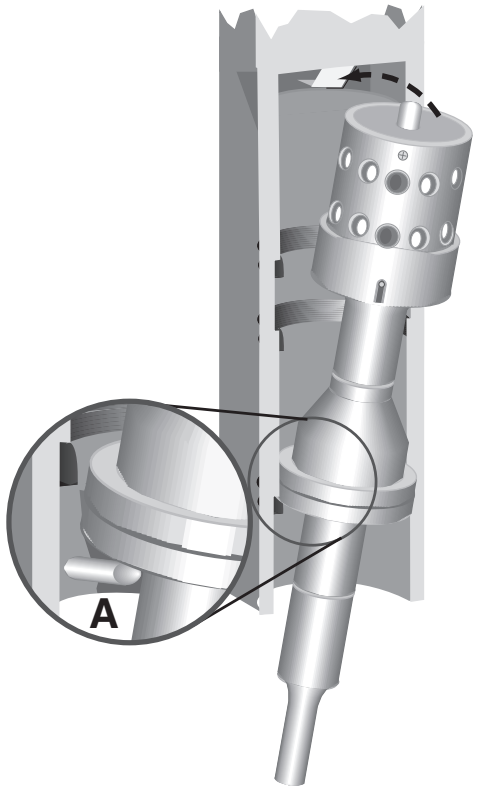

Figure 4-7 Stack Installation

NOTE

When all door screws are tightened, a small gap between the door and stack housing is normally present.

Fixture Installation

There are three steps involved in installing a fixture.

- Aligning the fixture with the horn,
- Leveling the fixture to provide the necessary support, and
- Rigidly securing the fixture to the mounting surface.

Fixture Alignment

To safely align the fixture under the horn, use the following procedure. Refer to Figure 4-8.

1. Place the fixture, with unwelded parts, under the horn.
2. Initially align the two slots in the fixture over two of the seven mounting holes on the base plate.
3. Install the two fixture hold-down bolts with washers, and finger tighten.
4. Ensure the E-STOP is released, then start up the system normally.
5. Perform the following steps, depending on the system:

For generator front color display:

a) From the main menu, go to Process Setup.
b) Scroll down to Trigger Type, select Change Type, then select Force.
c) Select Sensing Start Position.

For *iQ Explorer* or *iQ Explorer II*:

a) For Trigger Type, select Force.
b) Press Teach next to Sensing Start Position or Sensing Start Distance.

6. Hold the two operate switches to lower the horn. Before the horn makes contact with the parts, change the Speed to Medium, then hold the switches again to lower the horn further.
7. After the horn slightly depresses the parts together, tighten the two hold-down bolts.
8. Return the press to the home position as follows:

For generator front color display:

Push the Back button, and follow the instructions on the display.

For *iQ Explorer* or *iQ Explorer II*:

a) Select Exit.
b) Press No when asked to set the position.
c) Follow the instructions on the screen.

WARNING

Any fixture manufactured by a third party must comply with all OSHA and ANSI requirements. All fixtures must be guarded as necessary.

Dukane Corporation does not assume any responsibility or liability for fixtures manufactured by the customer or any third party manufacturer.

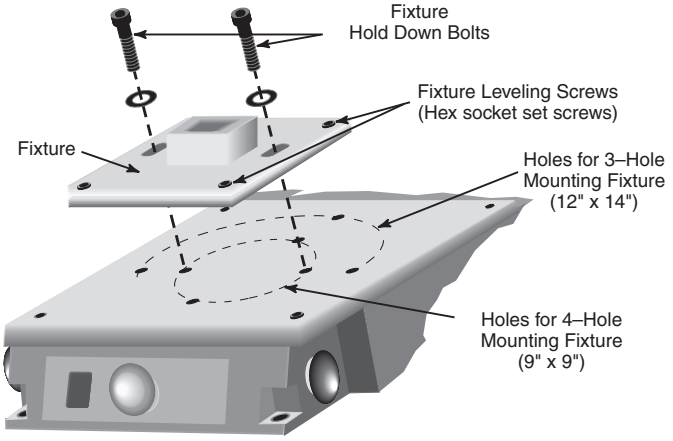

Figure 4-8 Fixture/Base Layout

Continued

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Adjusting the Travel Limit

Electronic Bottom Stop

Adjust the press travel limit (Electronic Bottom Stop) so that the horn stops above the fixture. This prevents pinch points and avoids horn damage if the acoustic stack assembly descends when a part is not in the fixture.

1. The acoustic stack should be in the press, and the fixture/nest should be positioned.
2. Perform the following steps, depending on the system:

For generator front color display:
   a) From the main menu, go to Process Setup.
   b) Select the Travel Limit button.

For *iQ Explorer* or *iQ Explorer II*:
   Press Teach next to Travel Limit.

3. Hold the two operate switches to lower the horn.

   Allow the horn to reach a position just above the fixture/nest so that there is a gap of approximately .050" [1.3 mm]. If the gap must be smaller to allow the weld to complete properly, adjust it accordingly.

4. Set the travel limit and return the press to the home position as follows:

For generator front color display:
   a) Press the Use Position button.
   b) Press the Back button, and follow the instructions on the display.

For *iQ Explorer or iQ Explorer II*:
   a) Select Exit.
   b) Press Yes when asked to set the position.
   c) Follow the instructions on the screen.

NOTE

The fixture should be flat on the base. If the fixture is equipped with leveling jack screws, adjust the screws so that they do not interfere with seating of the fixture on the base plate.

NOTE

Do not overtighten the cap screws. This may flex the fixture plate.

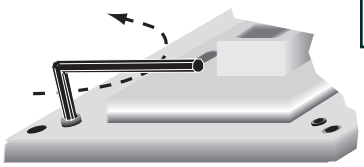

Figure 4-9 Loosening the Hold–Down Cap Screws and Jack Screws

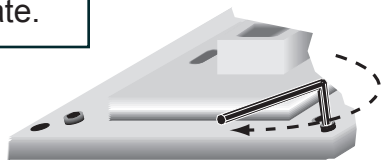

Figure 4-10 Tightening the Hold–Down Cap Screws and Jack Screws

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Fixture Leveling

For most applications, the fixture must be mounted so that the contacting surfaces on the horn are parallel to the contacted surfaces on the plastic part. This ensures that a consistent, even weld will result. To level the fixture, do the following:

1. Place a part in the fixture.
2. Loosen (turn counterclockwise) the hold-down bolts or cap screws and the four leveling jack screws on the fixture plate. Refer to Figure 4-9.
3. Perform the following steps, depending on the system:

   For generator front color display:
   a) From the main menu, go to Process Setup.
   b) Scroll down to Trigger Type, then press the Sensing Start Position button.

   For *iQ Explorer* or *iQ Explorer II*:
   Press Teach next to Sensing Start Position or Sensing Start Distance.

4. Hold the two operate switches to lower the horn. Just before the horn makes contact with an unwelded part, change the Speed to Medium or Slow.

   Lower the horn to apply some light pressure (approximately 10 - 20 lb.)

5. Turn the four jack screws clockwise until a slight resistance is felt. Refer to Figure 4-10.
6. Tighten the hold-down cap screws by turning them clockwise until a firm resistance is felt.
7. Return the press to the home position as follows:

   For generator front color display:
   Push the Back button, and follow the instructions on the display.

   For *iQ Explorer* or *iQ Explorer II*:
   a) Select Exit.
   b) Press No when asked to set the position.
   c) Follow the instructions on the screen.

The following procedure may be helpful in leveling the fixture in some applications. To perform this procedure, use a piece of carbon paper and a piece of white paper.

1. Place a sample part in the fixture.
2. Place a piece of white paper on top of the sample part.
3. Place a piece of carbon paper, carbon side down, on top of the white paper.
4. Press the OFFLINE button on the generator if one is present. If not, select the Utilities tab in ***iQ Explorer*** and check the Off-line box.
5. Cycle the equipment by activating both cycle activation switches on the base or by triggering the automation switch. (See the NOTE below.)

   When one cycle is completed, the pressure developed between the horn and the sample part will have left marks from the carbon paper on the white paper. If the fixture is not level, the carbon markings will be darker in some areas than in others. All carbon markings will be uniform when all adjustments have been made properly.

6. Adjust the leveling of the fixture and repeat this procedure as necessary until you are confident that the fixture is level.
7. To re-enable ultrasound for welding, press the ONLINE button on the generator if one is present. If not, uncheck the Off-line box in the Utilities tab in ***iQ Explorer***.

On some applications, leveling may be difficult to achieve as described above. In these instances, sample parts would need to be welded, measured for parallelism, and the leveling adjusted correspondingly.

NOTE

Since no melting will occur during this process, the intended "weld collapse distance" should be much smaller than on a typical weld to avoid generating excessive forces.

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SECTION 5

Controls and Indicators

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Remote Controller 60
HMI 60

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Overview

This section contains information about the visual indicators, manual switches and adjustments of the components in a typical ***iQ*** ES system.

The press, generator, remote controller and HMI will be discussed.

Press

Refer to Figure 5-1 for location of the following items:

- **LED's**

  Servo Power - The Servo Power LED glows green when electrical power to the press has been activated.

Figure 5-1 Press Manual Controls and Indicators

Continued

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Trigger - The Trigger LED glows whenever the trigger point is reached.

- **Operate Switches**
  See the next page in this section for more information.
- **E-STOP Switch**
  See Page 58 in this section for more information.
- **Press Status Display**
  See Page 59 in this section for more information.
- **Thruster Height Adjustment Wheel**
  The adjustment wheel is used with the height locking handles. After the handles have been loosened to unlock the thruster from the column, the wheel can be turned to move the thruster into the desired position.
  The adjustment wheel is found **on the side of the press on models 43S215, 43S220, and 43S340**. See Figure 5-1.
  The wheel is found at the **back of the press on models 43S245-AX**. See Figure 5-2.
- **Thruster Height Locking Handles**
  See ***Press Height Adjustment*** on Page 23.

Figure 5-2 Height Adjustment Wheel, Models 43S245-AX

Ergonomic Base

The ergonomic base, shown in Figure 5-3, consists of a cast base, base plate, left and right operate or cycle activation switches (black finger switches), abort switch (red palm switch), and a status display screen. At the back of the base is a cable connector for an interface between the ***iQ Series*** generator and the base front panel.

Base Plate

The machined base plate is bolted to the top of the ergonomic base. It has a series of tapped holes for mounting fixtures. For details on the alignment and leveling of the fixtures, see ***Section 4: Stack/Fixture Setup***.

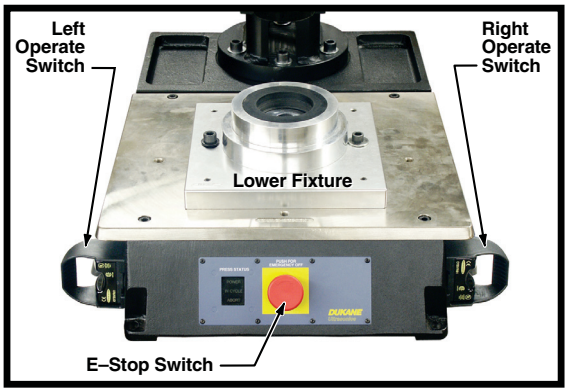

Figure 5-3 Ergonomic Base Controls

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Cycle Activation (Operate) Switches

Located on either side of the base are two optical operate switches. These are shown in Figures 5-3 and 5-4. These switches use Infrared (IR) sensors. They comply with OSHA and CE safety standards. Both switches are identical.

Each switch has a small red LED that is dimly illuminated whenever the power is on, as shown in Figure 5-4. When the operator places their finger in the tray, the LED brightens and a second LED in the opposite corner of the tray illuminates to indicate the switch has been activated as shown in Figure 5-5. Both switches must be activated simultaneously (within approximately 0.35 seconds) to initiate a weld cycle or jog the press while in "Teach" mode.

Emergency Stop (Abort) Switch

A red Emergency–Stop (E-STOP) switch is located in the center of the base as shown in Figure 5-3. The emergency stop switch must be in its reset position before the operate switches will function.

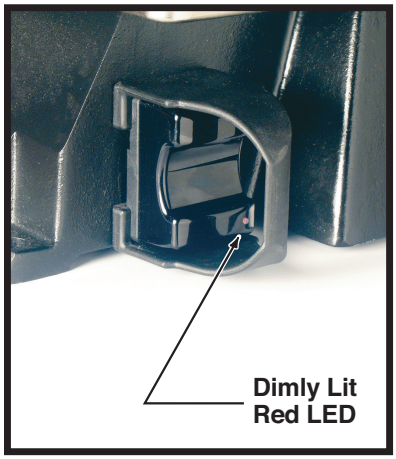

Figure 5-4 Right Operate Switch in Standby Mode, One LED Dimly Lit

Figure 5-5 Right Switch in Operate Mode, Both LEDs Brightly Lit

WARNING

Any modifications to the Activation Switch (also known as the Operate Switch) circuit must comply with all OSHA and ANSI requirements. Compliance with all local building and electrical codes is also required.

Dukane Corporation does not assume any responsibility or liability for circuitry modifications made by the customer or by any third party manufacturer.

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Using the E-STOP Switch

To Stop the System with E-STOP

Push the red, Emergency Stop (E-STOP) switch to the OFF position. This is also known as setting the E-STOP. See Figure 5-6.

Pressing the E-STOP switch causes the generator to:

- Immediately turn off the ultrasound,
- Remove electrical power from the press, and
- Initiate a software abort sequence.

The following indicators are displayed when the E-STOP *is set, depending on system configuration.*

Using an HMI Display

The HMI display shows this window:

E-Stop has been pressed by an operator!

OK

Choose to acknowledge the message, or not. The OK on the screen may be tapped to acknowledge the message, but in any case the message disappears when the E-STOP switch has been reset.

Using an *iQ* Generator Color Front Panel Display

The Main Menu background color turns to red.

Resetting the E-STOP

The E-STOP switch must be in its reset position before the power is restored, and before the operate switches will function.

To reset the E-STOP, twist the large red button about 45 degrees clockwise, which will cause the button to spring out. This is shown in Figure 5-6.

The following indicators are displayed once the E-STOP *is reset, depending on system configuration.*

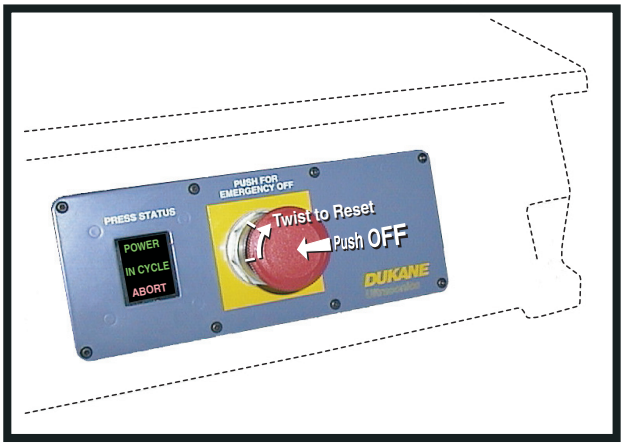

Figure 5-6 Setting and Resetting the E–STOP Switch

WARNING

Any modifications to the Emergency Stop Switch (also known as the E-STOP or Abort Switch) circuit must comply with all OSHA and ANSI requirements. Compliance with all local building and electrical codes is also required.

Dukane Corporation does not assume any responsibility or liability for circuitry modifications made by the customer or by any third party manufacturer.

Using an HMI Display

Once the E-STOP has been reset, the HMI displays messages that show what is happening while the system restarts.

As the software initializes, a message appears:

Initializing Servo Press...
Please Wait.

Next, there will be a message prompting the operator to Home the welder.

Follow the instructions on the HMI to Home the welder.

Continued

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Using an *iQ* Generator Color Front Panel Display

After the E-STOP switch is reset, this message appears on the display:

> Servo in Test Mode.
> Please Wait.

As the software initializes, the message appears:

> Initializing Servo Press...
> Please Wait.

This is followed by a prompt to Home the machine.

Follow the procedure below.

Homing the Welder

Manual Operating Mode

Activate both operate switches, and hold them until the homing message on the HMI or generator display disappears.

Automatic Operating Mode

An external input is required to home the welder. This signal is supplied by the user.

Detailed information on configuring external signals to perform homing and other functions is contained in application note AN507 available from the Dukane website (*www.dukane.com/us > Downloads > Application Notes*).

Press Base Status Display

The function of the Press Status Display - See Figure 5-1 - is to indicate one of three status conditions of the press:

- **POWER** - When the E-STOP switch is pulled out, the green POWER status light indicates that power is applied to the press.
- **IN CYCLE** - When both cycle operate switches are pressed, the IN CYCLE display of the status indicator is ON for the duration of switch activation.
- **ABORT** - When the E-STOP switch is pushed in, the red ABORT status indicator illuminates. Press operation is no longer possible.

NOTE

The E-STOP status bar is displayed at the bottom menu bar of the HMI screen.

E-Stop Status	Status Color
E-STOP is Reset	Gray
E-STOP is Set	Red

Table 5-I E–STOP Status Color

Generator

The rear panel has an AC breaker/switch that turns power to the generator on or off. See Figure 5-7.

On most units the front panel has a power button that is lighted (green) when power has been activated. On some units, the front panel has a power light (green) only (i.e. no power button).

It is beyond the scope of this manual to describe and discuss the other manual controls featured on generators with color displays. Refer to the ***iQ*** Generator ES manual, 403-584, for detailed information about all the front panel controls.

Remote Controller

The rear panel has an AC breaker/switch that turns power to the controller on or off. See Figure 5-7.

The front panel has an LED that lights when power to the unit has been activated.

HMI

On the rear panel, the HMI has a power switch with integrated LED. The LED lights when power to the unit has been turned on.

Below the HMI display on the front of the unit a set of LED's light to reflect the unit's activity.

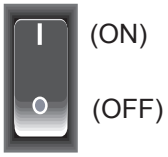

Figure 5-7 Typical AC Breaker/Switch

NOTE

See the ***Section 6, Operation*** for more information about using the switches in start-up and shutdown.

SECTION 6

Operation

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Overview

After setup is complete, operation can begin.

This section on system operation will cover basic, general guidelines for operation.

By way of review, a typical system has:

- an ***iQ*** generator,
- an ***iQ*** press (including thruster, switches, controls, and cables),
- a stack (transducer, booster, horn), and fixturing.
- a user interface (HMI) or computer (optional on some systems)
- control and data acquisition software (optional on some systems)

As described previously there are **Remote** and **Integrated** versions of the system to consider. (See ***Section 1,*** Page 3.)

System Makeup - System operating requirements depend on what type of system there is, what its options are, what user-supplied equipment is interfaced with the system, and on what the application is.

Control - Control of the welding process depends on the system configuration. For generators with a color front panel display (Q-Series), the user may control the welding system with either the ***iQ*** generator's color front display, or through the ***iQ Explorer II*** software. For generators without a display (A-Series), the system is controlled exclusively via the ***iQ Explorer*** software running on an HMI or computer.

Other Considerations - Operating the system includes making whatever adjustments there may be to the press, acoustic stack and tooling.

For additional information about the other key Dukane components of the system, see these User Manuals:

Generators with color display (Q-Series):

• ***iQ*** Ultrasonic Generator/Power Supply ES (Part No. 403-584), and

• ***iQ Explorer II*** (Part No. 403-585), and

Generators without display (A-Series):

• ***iQ*** Ultrasonic Generator/Power Supply ES (Part No. 403-575), and

• ***iQ Explorer*** (Part No. 403-579)

Start-up

Generator

iQ Generator with AC Breaker and Power Button

The steps below describe the preferred start-up sequence of the servo ultrasonic press system. Details on powering up individual components are provided in the subsequent paragraphs.

1. Set the AC breaker on the press or remote controller on.
2. Ensure the E-Stop is not active (i.e. system is not aborted).
3. Power up the generator.
4. If using an HMI, power it up, and start the iQ Explorer or iQ Explorer II software.
5. Power up any other equipment interfaced with the welder.
6. Press the rear panel AC breaker/switch to ON. (Figure 6-1)
7. The front panel lighted power button (Figure 6-2) will glow RED when in the extended position. This means the generator is in standby.
8. To activate the generator, press the RED power button lightly. It will flash a few times, then will glow a steady GREEN. The generator then begins its start-up sequence. The LCD display, if present, identifies the Dukane ***iQ*** Series type first. The sequence ends when the Main Menu is displayed.

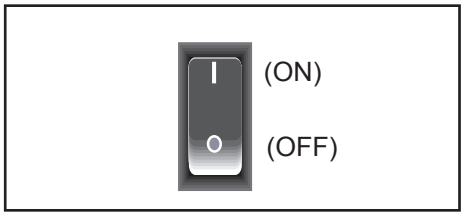

Figure 6–1 Typical AC Breaker/Switch

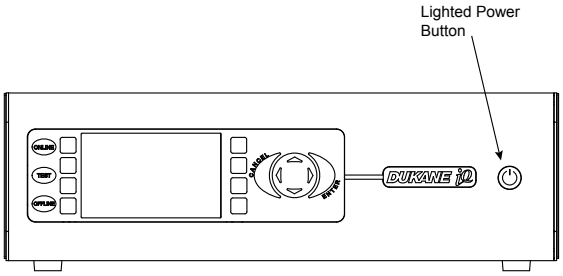

Figure 6–2 iQ Generator with Color Display and Power Button

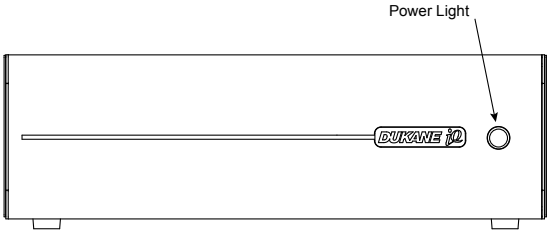

Figure 6–3 iQ Generator with Power Light

iQ Generator with AC Breaker Only

1. Press the rear panel AC breaker/switch (Figure 6-1) to ON.
2. The front panel power light (Figure 6-3) will glow GREEN after some time (up to 40 seconds on some systems). This means the generator's power has been turned on.

Remote Controller

For systems equipped with a remote controller, press the rear panel AC breaker/switch (Figure 6-1) to the ON position.

Press Base

When powered, the press base display (Figure 5-1) shows the word POWER.

Press

Press the AC breaker/switch, located on the rear panel, to ON.

See Figure 6-4 for switch location. The SERVO POWER LED will be lit GREEN. See Figure 6-2.

iQ HMI

Press the power button to the on position. The button is under the power icon located on the left side of the rear panel. When power is on, an LED on the power button is lit.

Other Equipment

Power up any other system components - automation equipment, etc.

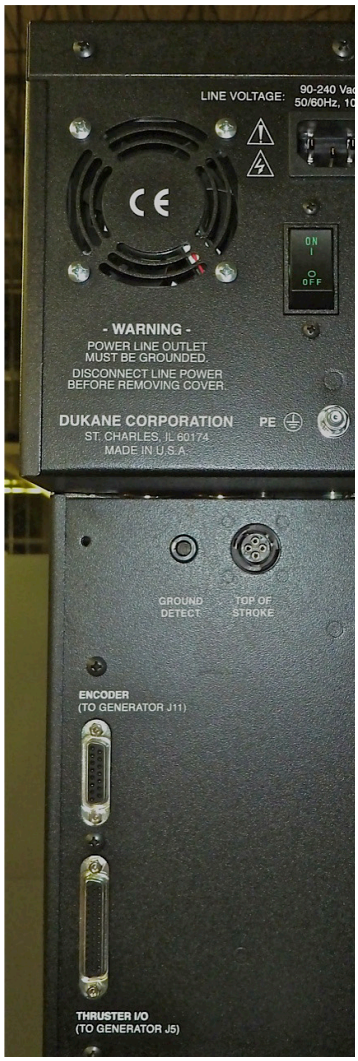

Figure 6–4 Servo Press AC Breaker/Switch Location

Control Functions

Various functions, such as controlling the system and monitoring the welding process are accomplished by one of several possible means, depending on the system configuration.

For systems equipped with generators containing a color front panel display (Q-Series), the user has the option of controlling the welding system with either the generator's color front display, or through the ***iQ Explorer II*** software.

For systems equipped with generators not containing a display (A-Series), the system is controlled exclusively via the ***iQ Explorer*** software running on an HMI or computer.

NOTE

Most of the examples in this manual illustrate concepts using the ***iQ Explorer II*** software. Although there are differences between ***iQ Explorer*** and ***iQ Explorer II*** , the functionality of ***iQ Explorer*** may be inferred from these examples.

Starting and Stopping the Weld Cycle

Starting a Weld Cycle

Before starting a weld cycle, ensure the process settings are correctly programmed and that the parts to be welded are loaded in the fixture. Check that the Sensing Start Position is set properly (if used) so that the horn does not come in contact with the part at this position - see the ***Quick Start*** guide that follows in this section for details.

For press systems equipped with a standard Dukane base, the cycle is started by activating both opti-touch operating switches at the same time (i.e. within 0.35 seconds of each other). Maintain switch activation until the ultrasound starts, which is indicated by the TRIGGER LED becoming lit on the front of the press. De-activating the switches prior to the start of ultrasound aborts the cycle and causes the press to retract to the Top-of-Stroke position.

For press systems integrated with external automation, starting the weld cycle is typically accomplished through the Cycle Start Input. See the generator manual for details.

Stopping the Weld Cycle - Normal Conditions

The cycle stops when the programmed welding cycle ends or when the generator's Cycle Stop input is activated.

Stopping the Weld Cycle - Emergency Conditions

For press systems equipped with a Dukane base, push in the E-STOP button to abort the weld cycle (see ***Section 5***, ***Controls and Indicators*** and Figure 5-6).

NOTE: Once the E-STOP button is pressed in, power to the servo is turned off, and the horn will not move up. To allow the servo to move again, the E-stop must be reset and the press controller must complete its start-up process, which takes some time. If there is a need to move the horn up quickly, such as in case of accidental entrapment, the horn can be pushed up manually on some models (43S245-AX and 43S340). On other models, the entire thruster can be moved up on the support column by unlocking the height locking handles (see ***Section 3***, ***Installation*** and Figure 3-9).

Turning the generator off as described below will also stop a weld cycle.

iQ Generator with AC Breaker and Power Button

Applies to Models with 2400 Watts or less.

1. Press the generator's front panel power button. The button color changes from GREEN to RED.

2. In addition, you may push the power switch on the generator's rear panel to the OFF position. The front panel lighted power button goes out indicating that power has been turned off.

iQ Generator with AC Breaker Only

Applies to Models with 3600 Watts or greater.

1. Press the rear panel AC breaker/switch (Figure 6-1) to OFF.

2. The front panel power light (Figure 6-3) will go out. This means the generator's power has been turned off.

Software Support Features

Two support features incorporated into the ***iQ Explorer*** and ***iQ Explorer II*** software are its virtual numeric pad/keyboard and its help system.

Numeric Pad and Keyboard

Select for the keyboard.

Select for the numeric pad.

See Figure 6-5 to the right.

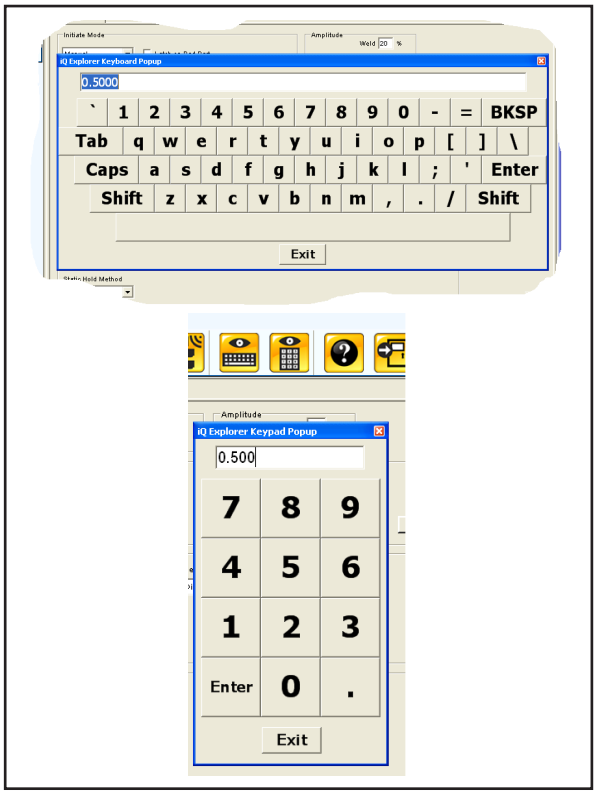
iQ Explorer Keyboard Popup
0.5000
` 1 2 3 4 5 6 7 8 9 0 - = BKSP
Tab q w e r t y u i o p [ ] \
Caps a s d f g h j k l ; ' Enter
Shift z x c v b n m , . / Shift
Exit
iQ Explorer Keypad Popup
0.500
7 8 9
4 5 6
1 2 3
Enter 0 .
Exit

Figure 6-5 ***iQ Explorer II***, Keyboard and Numeric Pad

Help System

The help system is a reference tool to assist in understanding key terms of the ultrasonic welding process. The ***iQ Explorer/iQ ExplorerII*** help function can be accessed using the top menu bar, or by pressing the F1 key as explained below.

Top Menu Bar

Help is one of the top menu bar items as shown in Figure 6-6.

Clicking on **Help** and then selecting **Help** from the pull-down menu will open the **Help** window.

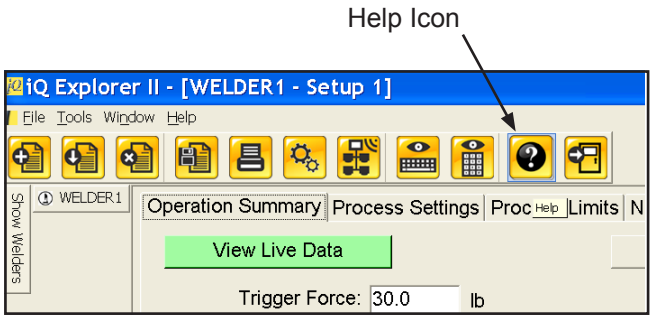

Figure 6-6 Help from Top Menu Bar

A **Contents** tab and an **Index** tab are two entry points to the help file information.

Contents groups the help file information into these eight categories:

- Hardware
- Process Control
- Process Limits
- Notes
- Graph
- Utilities
- System
- Options

The **Index** is an alphabetical list of words and phrases.

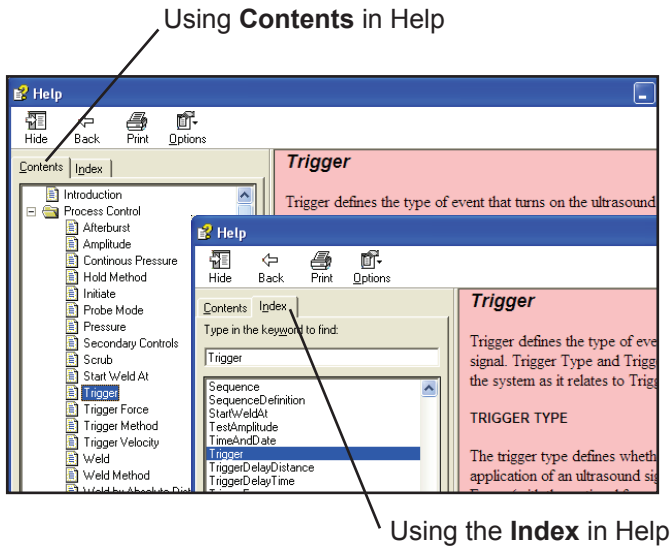

Figure 6-7 Contents and Index in Help

Figure 6-7 illustrates that the term, Trigger was found through both **Contents** and the **Index**.

Using the F1 Key

The F1 key can be pressed to activate **Help** when:

1. The cursor is positioned in an item that can be edited, such as a text box, drop down list, or check box and,
2. That item is linked to **Help**.

NOTE

If no keyboard is available, use the iQ HMI Windows keyboard, or press Help in the top menu bar, and navigate to the desired topic.

Quick Start - *Using iQ Explorer II*

Step 1 - Read the Software User's Manual

Read the ***Installation*** section of the ***iQ Explorer II*** *User's Manual,* 403-585. Ensure that a proper connection of the ***iQ Explorer II*** software and the servo press has been made. See Figure 6-8 below.

Important: Understand and familiarize yourself with the operation and navigation of the ***iQ Explorer II*** user interface software. Refer to the ***iQ Explorer II*** *User's Manual* - ***Section 4, Operation***.

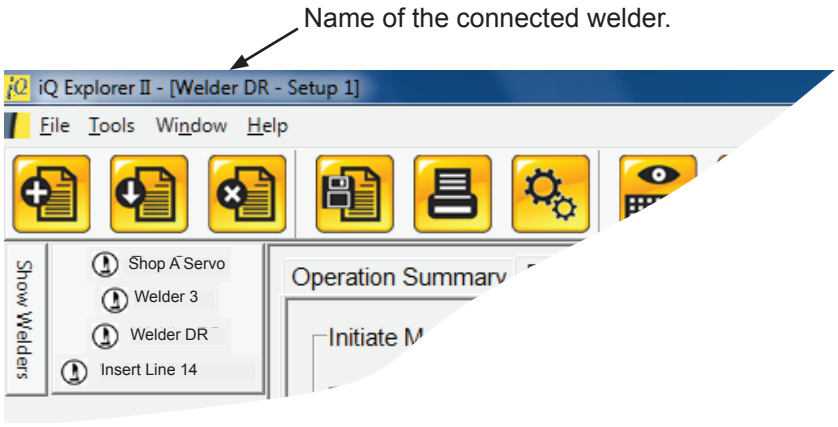
Name of the connected welder.
iQ Explorer II - [Welder DR - Setup 1]
File Tools Window Help
Show Welders
Shop A Servo
Welder 3
Welder DR
Insert Line 14
Operation Summary
Initiate M
Names of active welders in the network appear when Show Welders tab is clicked.

Figure 6-8 ***iQ Explorer II***, Start-up

Step 2 - Select Unused Setup

After moving to the Hardware tab, click on the Setup File Name box, and select an unused setup. This will ensure that you do not overwrite a pre-existing setup.

See Figure 6-9.

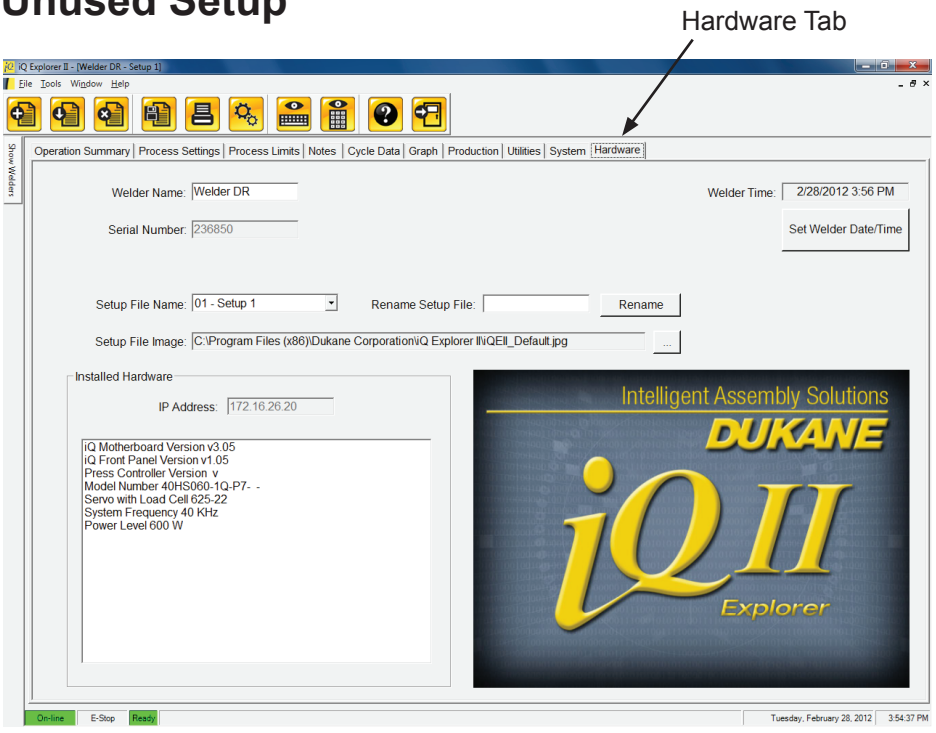

Figure 6-9 ***iQ Explorer II***, Start-up, Hardware Tab

Step 3 - Navigate to the Process Settings Tab

See Figure 6-10.

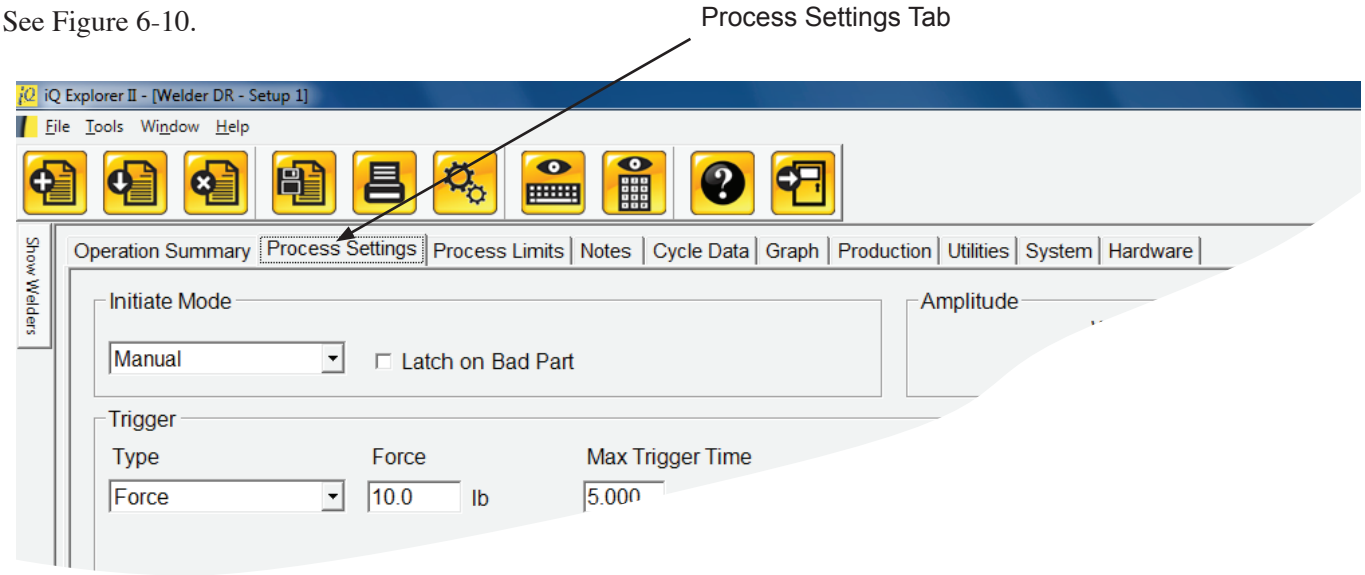

Figure 6-10 ***iQ Explorer II***, Process Settings Tab

Step 4 - Set Cycle Initiation Mode

See Figure 6-11.

NOTE

This Initiate Mode selection assumes there is a stand-alone, benchtop system with manual operate switches.

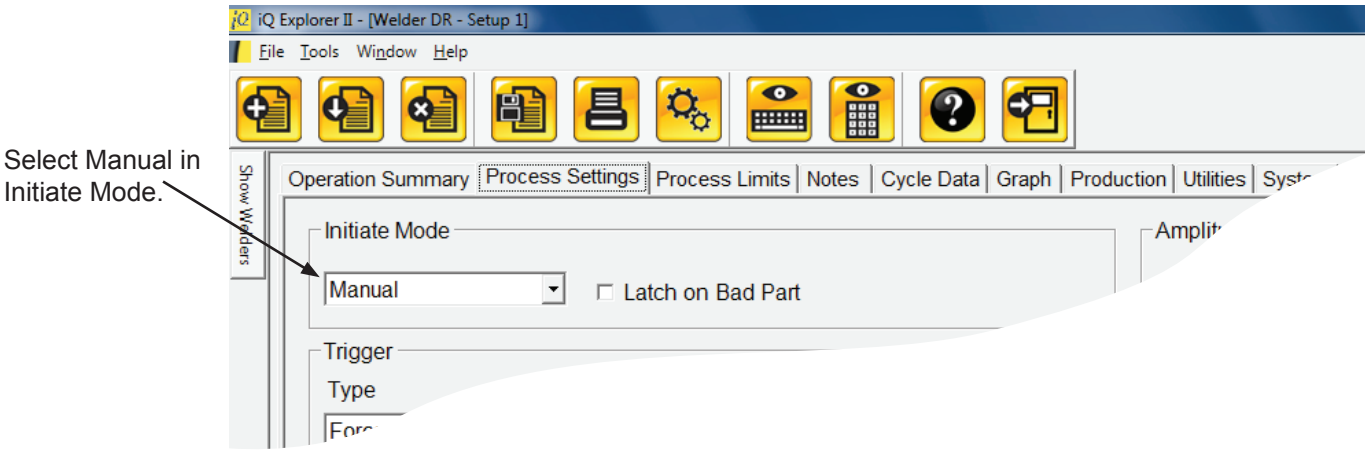

Figure 6-11 ***iQ Explorer II***, Process Settings > Initiate Mode

Step 5 - Specify Trigger Settings

Select Force as the type of trigger.

Then program the desired amount of force the press is to apply before ultrasound is initiated.

Next, program Max Trigger Time. This provides a measure of safety insuring the welder will fault if for some reason the welder never achieves the programmed trigger force. See Figure 6-12.

NOTE

The example shown in Figure 6-12 assumes trigger force for a part with four linear inches of weld would need between 32 - 42 lbs. of trigger force. A 20 inch linear weld may require between 52 - 70 lbs. of trigger force. See Figure 6-13, Initial Trigger Force Settings.

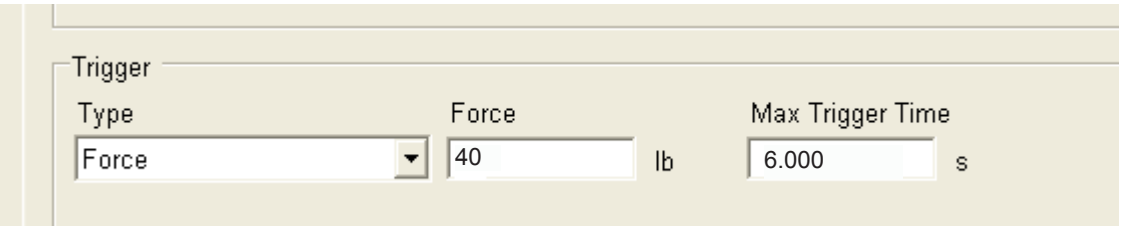

Figure 6-12 *iQ Explorer II*, Process Settings > Trigger > Type, Force, Max Trigger Time

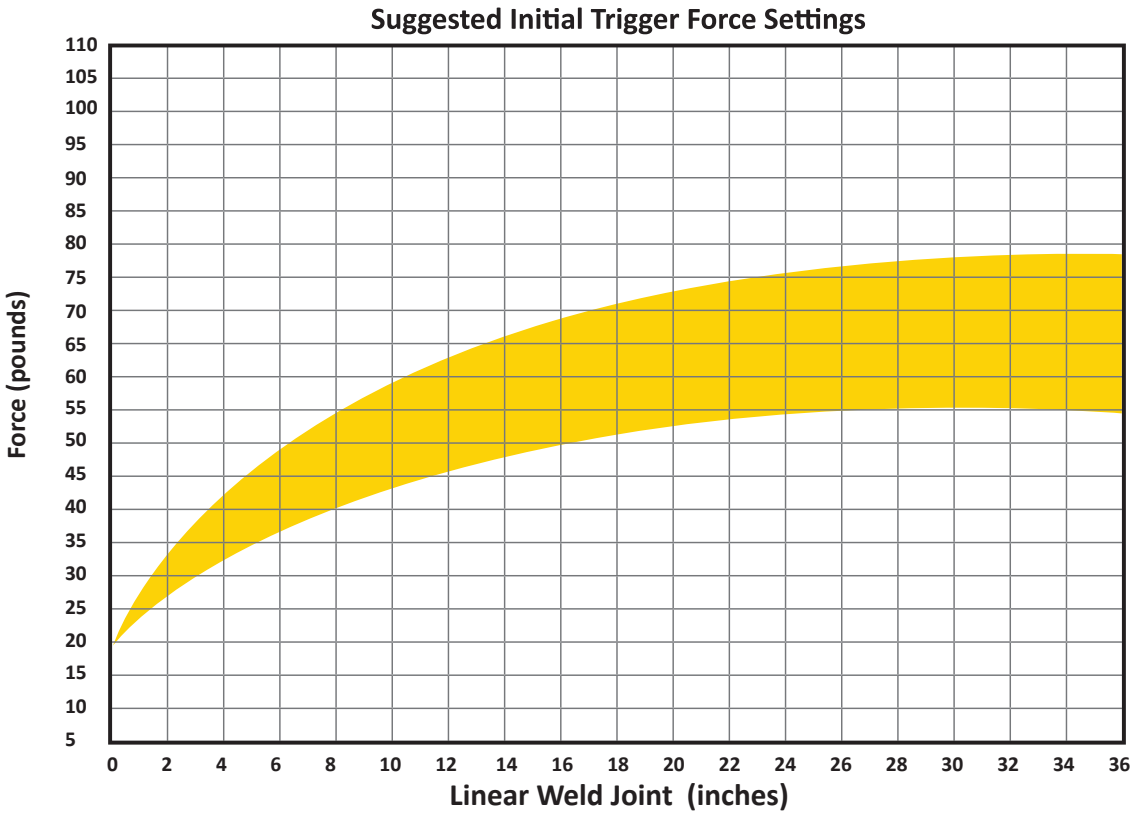

Figure 6-13 Suggested Initial Trigger/Force Setting

Step 6 - Program Sensing Speed

On the Process Settings tab, find Sensing Speed.

This is the speed (inches/millimeters per second) at which the horn will move during the approach just before reaching the trigger position. A typical starting value for Sensing Speed is 0.040 in/s (1.0 mm/s). Sensing Speed can be set higher for shorter cycle times, or lower for greater trigger force detection accuracy.

This feature is exclusive to the servo-controlled systems and allows for precise, accurate trigger forces.

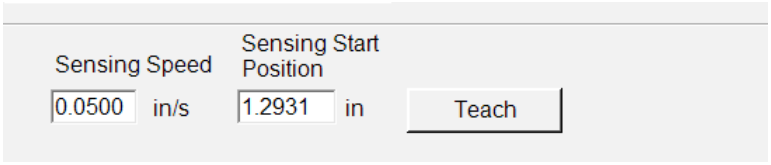

Figure 6-14 *iQ Explorer II*, Process Settings > Sensing Speed

Step 7 - Program Sensing Start Position

See Figure 6-15. Sensing Start Position is the actual position in the machine travel where the system begins to sense for the trigger force to be achieved. By the time the horn reaches the Sensing Start Position, it is already moving at the programmed Sensing Speed. It is critical to program the Sensing Start Position so that the horn is never in contact with the part at this position, taking into account the height variability of unwelded parts. Failure to do so may result in equipment damage. If you do not know the position where this contact is made, select the Teach button. See Figure 6-16.

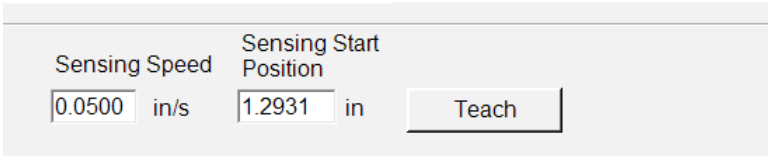

Figure 6-15 *iQ Explorer II*, Process Settings > Sensing Start Position

Step 8 - Teach Sensing Start Position

After pressing Teach, you will see a window similar to the one shown in Figure 6-16.

Place an unwelded part into the fixture. Press both operate switches to jog the horn down to within 0.010 - 0.030 inches above the part. The stroke position of the thruster will be shown in the Current Position box. Once you are at the desired position, press Set to program that distance. Select Exit, and follow instructions to home the machine.

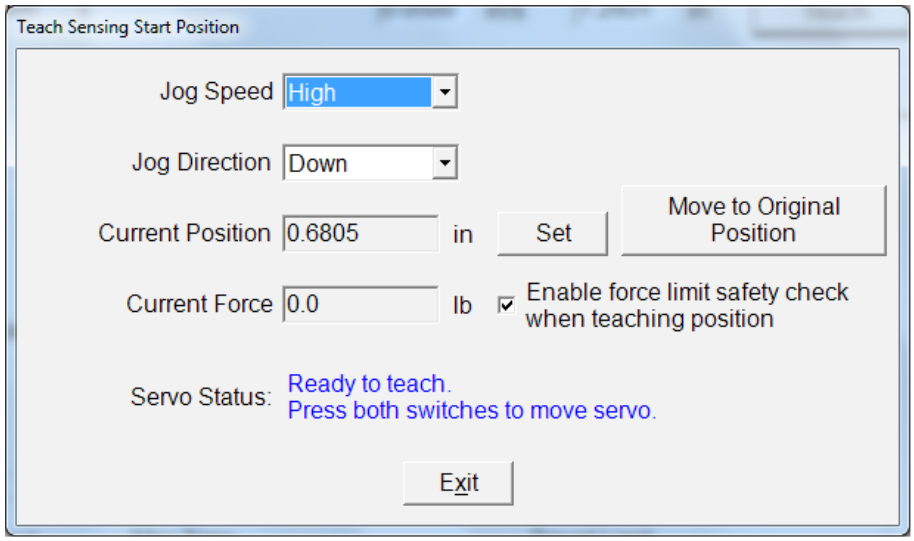

Figure 6-16 *iQ Explorer II*, Teach Sensing Start Position

Step 9 - Program Weld Characteristics

Primary Method

On the Process Settings tab, find Weld > Primary Method, and select Collapse Distance.

Collapse Distance - This is the distance the welder advances once the programmed trigger force is reached. Usually this distance is the height of the energy director, or shear joint of the part being welded.

Max Time is a component of the weld method intended to offer a measure of safety. If the programmed parameter is not achieved within this time window (2 seconds as shown in the example of Figure 6-17), the system will fault.

NOTE

Programming these weld parameters is similar to programming the Dukane DPC IV Plus or other pneumatic systems. Weld methods are: Collapse Distance, Absolute Distance, Energy and Peak Power.

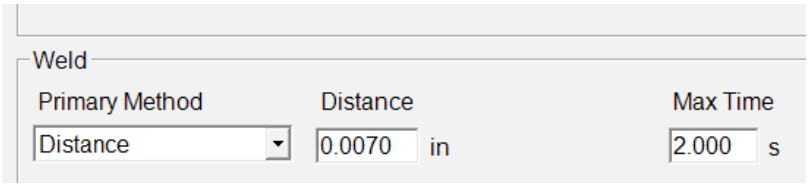

Figure 6-17 *iQ Explorer II*, Process Settings > Weld > Primary Method

Advanced Users - NOTE

Advanced users may refine weld control after programming a primary method by choosing a secondary weld method. This selection is shown below.

Secondary Method

Continue programming weld characteristics by selecting one of the Secondary Methods available:

Position, Energy, or Peak Power.

The purpose of the secondary method is to end the weld phase if the selected method parameter value is reached. If Disabled is chosen, there would be no secondary weld method.

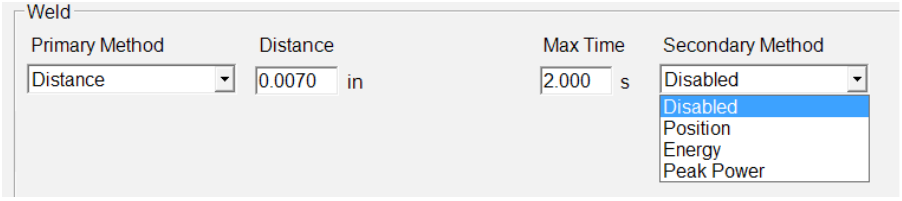

Figure 6-18 *iQ Explorer II*, Process Settings > Weld > Secondary Weld Method

Step 10 - Enable Melt Detect

See Figure 6-19.
This patented feature is found only on Dukane's servo press systems. If the feature is selected, the system will stop motion once the desired Trigger Force is achieved. The ultrasound will be initiated at this moment. Once the programmed force drop is detected, which indicates material softening or melting has begun, the motion will continue. This is the basis for Dukane's exclusive Melt-Match™ technology.

Figure 6-19 *iQ Explorer II*, Process Settings > Weld > Enable Melt Detect

The value of the After Force Drops By parameter is used to designate how much the force is to decrease relative to the Trigger Force before the horn will resume the programmed weld motion. For example, for a Trigger Force of 40 lb. and a value of 5% for After Force Drops By, the press would stop once the Trigger Force is achieved, and resume motion after the force drops by 2 lb. (5% of 40 lb.) below the Trigger Force, or 38 lb. A starting value of After Force Drops By is typically in the 5-10% range. The benefit of this option is significantly less stress on the parts and stronger weld bonds.

Step 11 - Specify Weld Motion

Immediately after Trigger (or Melt Detect) occurs, the press changes the speed of motion to the Weld Speed. Enter the selections described below and shown in Figure 6-20.
Weld Motion Control - Select Speed.
Weld Profile - Select Constant.
Speed - Enter desired weld speed. Typical weld speeds are in the range 0.010-0.060 in/s (0.25-1.5 mm/s). For users experienced with pneumatic welders, one method to estimate the weld speed is to divide the desired weld collapse distance by the weld time that would be expected on a pneumatic welder - the result is the average speed.

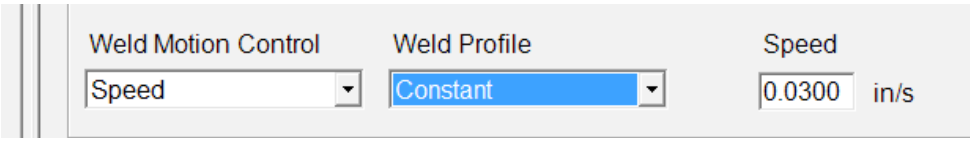

Figure 6-20 *iQ Explorer II*, Process Settings > Weld > Weld Motion Control, Weld Profile, Speed

Advanced Users - NOTE

Advanced users can optimize the weld speed using a Profile to produce superior weld strength and excellent cosmetic appearance. See Figure 6-21, where Segmented was selected as the Profile Type. This feature allows creating a speed motion profile during the weld cycle. The profile can be used to match the actual melt collapse of the weld joint.

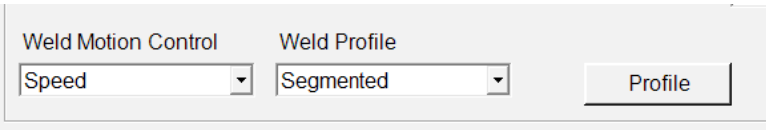

Figure 6-21 *iQ Explorer II*, Process Settings > Weld > Weld Profile > Segmented

Optimizing the Feature

The easiest way to make best use of this feature is to optimize the power draw throughout the weld cycle. This can be done by manipulating the Speed Profile until the Power Graph shows a smooth, constant result.

See Figure 6-22 at right for a view of a Segmented Speed Profile.To program the desired speeds, first select the segment by clicking on the square block under the down arrow, then type in the speed value in the numerical entry box. Repeat this process for the remaining segments.

View Speed Profile

Selecting View Speed Profile brings up a screen like one shown below.

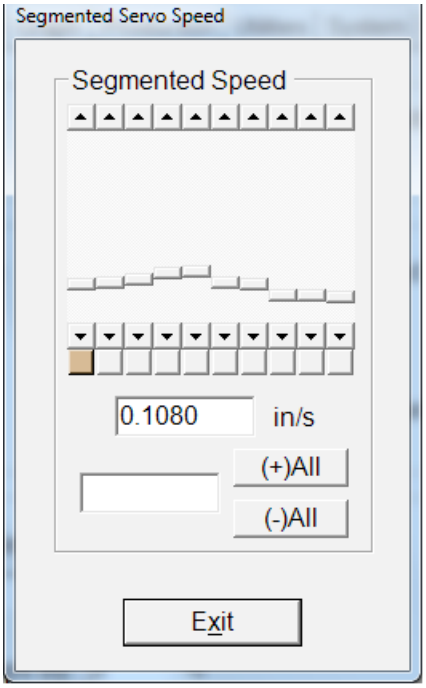

Figure 6-22 *iQ Explorer II*, View Speed Profile

Step 12 - Set Ultrasound Amplitude

A typical initial ultrasound weld amplitude setting is 100%. The range for this feature is between 20% and 100%. See Figure 6-23 below.

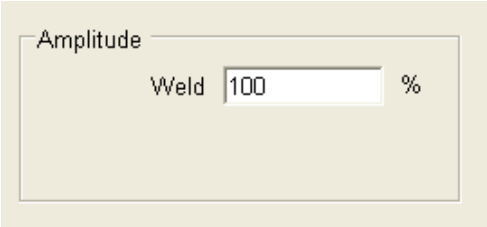

Figure 6-23 *iQ Explorer II*, Process Settings > Amplitude

Step 13 - Post Weld Settings

The post weld phase of the process is sometimes overlooked; however, it is important in achieving desired weld results. The ***iQ*** Servo Welder has several exclusive post weld control parameters that can improve weld bond strength and process repeatability.

Hold

There are two types of hold - Dynamic Hold and Static Hold. These types can be used together or separately.

Dynamic Hold Method

During Dynamic Hold, which occurs immediately after the weld phase, the press will continue to travel at the programmed hold speed with the ultrasound turned off.

This feature provides the ability to collapse the molten plastic after the ultrasonic signal is turned off, before material solidification. This feature can be beneficial in producing superior weld strength and appearance.

To program Dynamic Hold, find Post Weld > Dynamic Hold Method, and select Distance. Then enter the desired Hold Distance, Speed, and Max Time. The Max Time parameter is used to terminate the machine cycle if the dynamic hold distance is not reached within the allowable time window. See Figure 6-24.

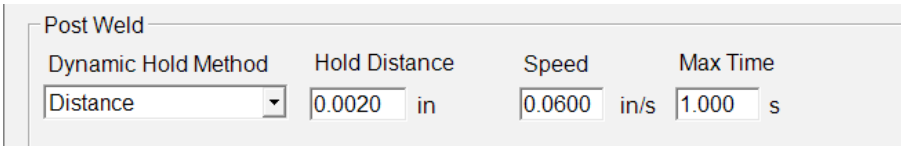

Figure 6-24 ***iQ Explorer II***, Process Settings> Post Weld > Dynamic Hold Method

Continued

Continued from Previous Page

Hold

Static Hold Method

After the completion of dynamic hold, if enabled, the press motion stops for a specified amount of time to allow for molten plastic to solidify. This phase is called static hold.

To program static hold, set the Static Hold Method to Time, and enter the desired Hold Time. Once the static hold phase is complete, the press retracts back to the Top-of-Stroke position.

This unique feature allows for superior consistency on overall part height. This is unlike a pneumatic press that continues to compress the part during the hold phase. In addition, Static Hold can contribute to stronger weld bonds. See Figure 6-25 below.

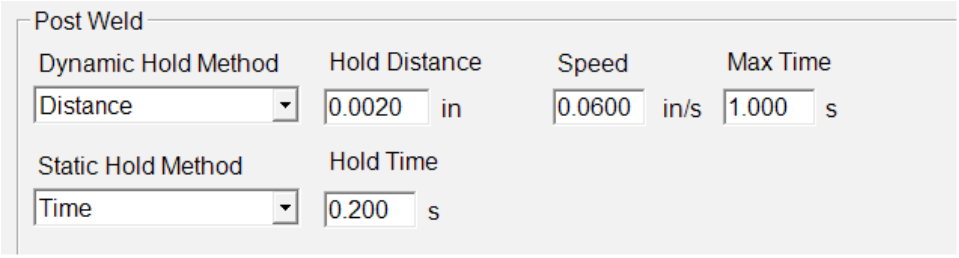

Figure 6-25 ***iQ Explorer II***, Process Settings> Post Weld > Static Hold Method

Step 14 - Test the Acoustic Stack

Run a test of the acoustic stack to confirm proper operation before welding parts.

Please go to ***Section 7*** of this User's Manual, ***System Operational Test***, where the system test procedures are outlined.

Step 15 - Specify Process Limits Behavior

See Figure 6-26. For each limit that is important to your application, use the drop down menu, and select Display.

These parameters will be displayed on the Cycle Data screen, and may be important for subsequent analysis of the weld process.

Once the process settings are fully developed for the application, the Process Limits can be set to Suspect and/or Bad to identify part assemblies of inferior weld quality.

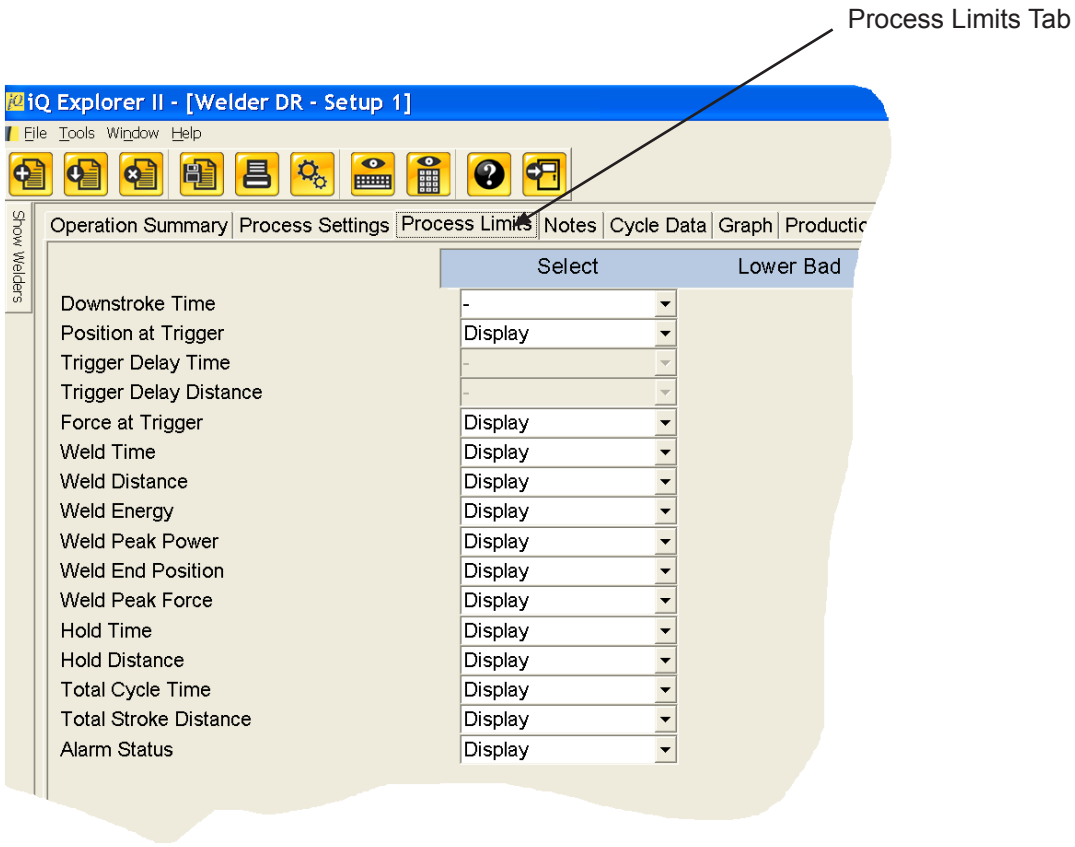

Figure 6-26 *iQ Explorer II*, Process Limits Tab

Step 16 - Run Weld Cycle

After all the parameters have been programmed, initiate the weld cycle.

Step 17 - View Weld Results

View the results at the Cycle Data tab to insure all parameters have been achieved. See the example shown below in Figure 6-27.

Detailed performance graphs for select parameters may also be reviewed by selecting the Graph tab.

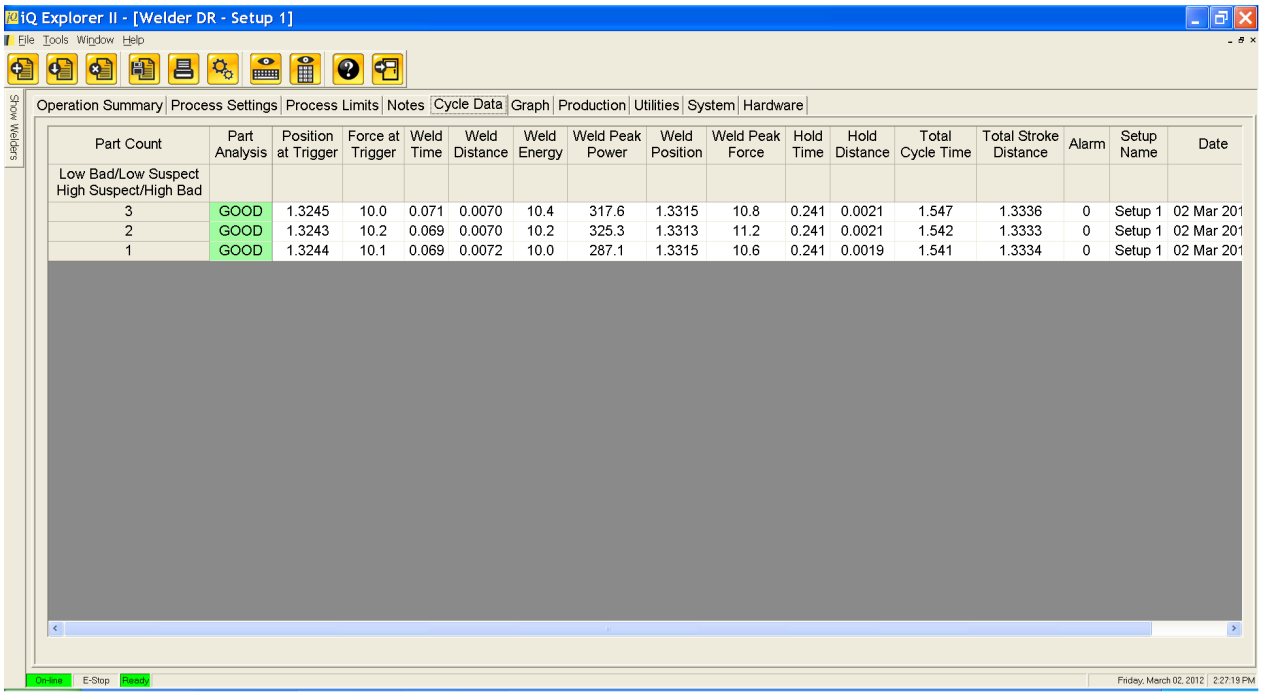

Figure 6-27 *iQ Explorer II*, Cycle Data Tab

Unique Features

The following paragraphs describe certain features of the ***iQ*** Servo system that may be useful for some applications.

Teachable Top-of-Stroke Position

The position from which the press initiates a weld cycle and to which it returns afterward is called Top-of-Stroke. With the ***iQ*** Servo Press, that position can be defined anywhere within the available stroke using direct numeric entry or position teaching.

The benefits of this feature are:

- Enhanced ability to optimize the required down stroke, which can be done without repositioning the thruster on the support column.
- Setup simplification. In situations where there are similar applications, the operator may want to keep the thruster position on the column the same. This can be done by creating various setups each with differing Top-of-Stroke positions, minimizing cycle times without having to change the position of the thruster on the column.
- Application switching repeatability. By avoiding changes in the thruster position on the column for different applications, changeovers between applications are highly repeatable due to digital Top-of-Stroke position control.

Setup Switching

A setup contains all the programmed parameters for one particular process. On an iQ Servo Press, the setup can be saved digitally in memory. All settings, including the home position, speed control, Top-of-Stroke and others are saved as part of a particular setup. **NOTE**: The only mechanical adjustment that might be needed is the repositioning of the thruster on the column. If the thruster is moved up or down when going to a new program, Sensing Start Distance (or Trigger Position) and Travel Limit have to be adjusted accordingly.

One instance of the use of this feature is as follows. A file is created for the setup of Part #1 and another file for the setup of Part #2. After running a batch of parts with the Part #1 setup, a switch to running parts for the Part #2 setup can be made quickly. Just load the saved file for Part #2, and the ***iQ*** Servo Press is ready for a different operation.

The benefits of this feature are:

- Time savings due to quick program switching.
- Enhanced setup repeatability due to digital parameter control.

Duplicating Process on Multiple Machines

If welding a high volume of parts, one of the main goals is to achieve repeatable results. It is likely that more than one machine will be welding parts simultaneously. With the iQ Servo, multiple machines (welders) can easily be programmed to duplicate a known process. With pneumatic systems, this presents a dilemma because of all of the minor mechanical differences that exist from welder to welder. Another consideration that can be problematic is government and agency approval that may need to be completed. ISO acceptance and FDA audits can be treated with greater confidence in the process and in the results for the iQ Servo Press. For a process that is audited on a regular basis or has a part that FDA needs to inspect, the iQ Servo Press has advantages of repeatability that can't be matched by a pneumatic press.

The benefits of this functionality are:

- Reduced welder-to-welder variability.
- Time savings due to elimination of pneumatic component adjustments.

SECTION 7

System Operational Test

Overview. 85
Operational Test of the Acoustic Stack. 86
Cycling the System. 89
Restoring Factory Defaults. 89

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Overview

An ***iQ Series*** generator must be operating and connected to the press/thruster in order to test the system.

For efficient operation of a Dukane ultrasonic assembly system, the ultrasound signal from the generator must match the frequency and phase angle (vibrational characteristics) of the acoustic stack that is being driven. Each acoustic stack has unique vibrational characteristics dependent on the combination of stack components. In addition, the characteristics of a particular stack may vary slightly during operation because of temperature and loading factors.

To match the generator output signal with the characteristics of a particular acoustic stack, the generator output frequency is adjusted by Dukane's patented phase-locked-loop Digi-Trac pulse-width modulation circuitry.

The Digi-Trac feature automatically adjusts the ultrasound signal to match the vibrational characteristics of the stack being driven. When the ultrasound turns on during each operating sequence, the Digi-Trac circuit monitors the motion of the acoustic stack on a frequency cycle-by-cycle basis and adjusts the ultrasound signal for the optimum setting. Because the Digi-Trac continuously monitors each operating sequence, it compensates for vibrational changes that occur during repeated operations due to heating of the acoustic stack components. It also compensates for changes that occur over longer time periods due to aging of the piezo electric crystals in the transducer, or possible wear of the ultrasonic horn.

The Digi-Trac feature excels in environments hostile to reliable operation, such as high duty cycles or high stress, and continuous-duty applications. In such situations, the Digi-Trac circuit compensates for the unique vibrational characteristics of each stack due to differences caused by aging, loading, temperature changes, and differences in horn configurations.

Operational Test of the Acoustic Stack

The following test procedure is suggested before starting the generator, to verify that the vibrational characteristics of the stack fall within the range of the Digi-Trac. All Dukane stack components are manufactured to tolerance specifications within this range. A non-Dukane horn, an improperly assembled stack, or a stack component that is worn or damaged, can result in vibrational characteristics outside these specifications, and will require some adjustment. This test reveals the existence of any problems and directs you to corrective action.

1. Check the following:
   a) Make sure that the correct booster and horn for the application are installed in the thruster.
   b) Check the ***iQ Series*** system components for proper grounding.
   c) Check the ultrasound cable connections on the generator and thruster for proper seating and security.
   d) Verify that the horn is not under load (not in contact with a fixture or part).
2. Turn the ***iQ Series*** generator AC breaker/switch to ON. For generators equipped with a lighted power button on the front, push the button to the ON position. The power button will start to flash RED on and off for some time, then turn a steady GREEN to indicate the generator is operating properly. If the light becomes RED and stops flashing, an internal generator failure has been detected - do not go any further with the test.
3. Using ***iQ Explorer II*** go to the Utilities tab. Press the TEST button, and hold it for the duration of the test period. See Figure 7-1.
   a) System Power Output:
      - If the power output display remains between 10 and 20 percent and the horn frequency is within the following ranges (depending on the frequency), proceed to the next step:

        15 kHz: 14.6 - 15.4 kHz
        20 kHz: 19.5 - 20.5 kHz
        30 kHz: 29.5 - 30.5 kHz
        40 kHz: 39.5 - 40.5 kHz

      - If the power output exceeds the 20% indication, there may be a problem with the acoustic stack.

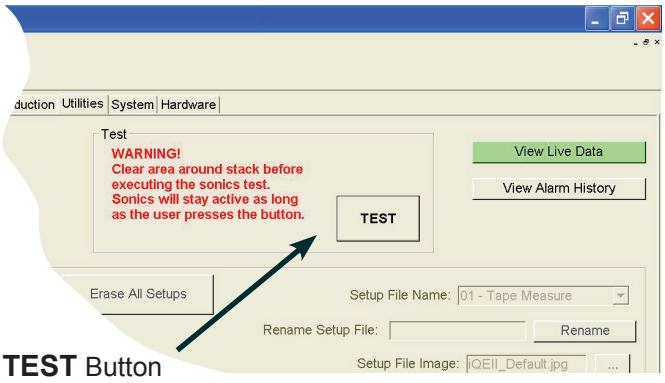

Figure 7-1 ***iQ Explorer II*** Utilities TEST Button

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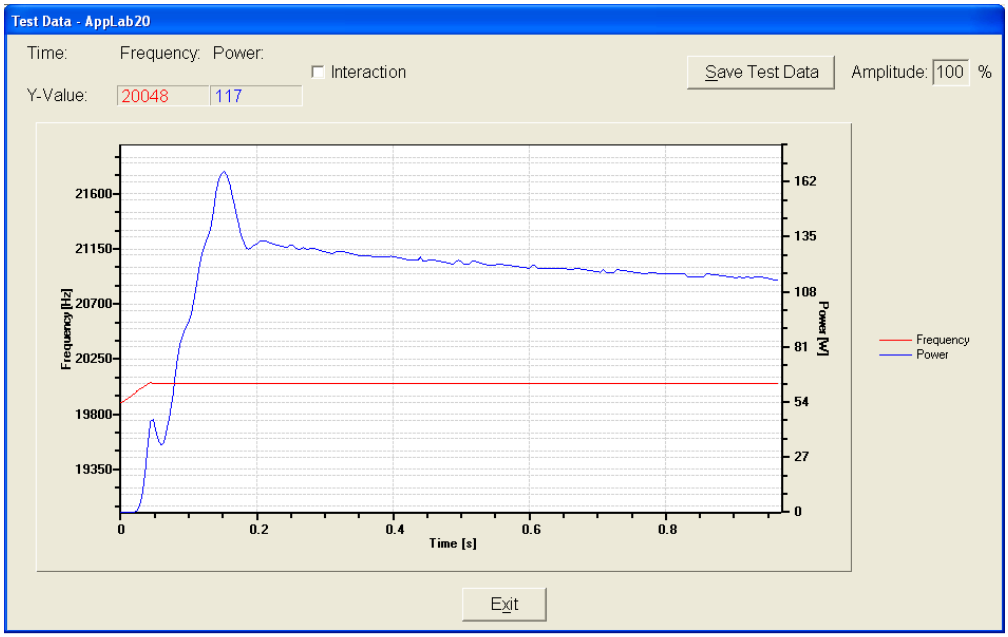

Figure 7-2 ***iQ Explorer II*** TEST, Screen Display

Acoustic Stack Test

b) If an overload fault is displayed, a mismatch has occurred between the generator's ultrasonic output signal and the stack.

Refer to ***Section 10, Troubleshooting***, and see the Press Alarm Message tables.

Also see Figure 7-3 that shows an example of an ultrasound-related error that caused cycling to stop.

4. If all the indicators pass their tests, the stack is within the Digi-Trac range.

The generator is operating at the optimum setting for this stack when the Watts displayed on the graph (after the test) is between 10 and 20 percent. The vibration amplitude of the horn and booster and the mass of the horn determine the amount of energy needed to vibrate the stack.

- If the system passes the tests of these four steps, proceed to the section called ***Cycling the System***, Page 89.
- If one or more of these tests have failed, go to the next step.

NOTE

Note the Frequency and Power values in the graph above.
You have the option of saving the test data for future reference.

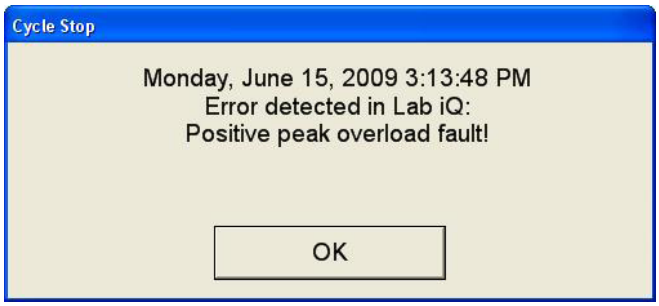

Figure 7-3 ***iQ Explorer II*** Error Detected - Cycle Stop

Continued

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Acoustic Stack Test

5. Turn the generator off. Check the stack for proper assembly, damaged components, or dirty mating surfaces. Recheck the ultrasound cable for proper connections. Repeat Steps 1 through 4. If the test still fails, go to the next step.
6. Turn the generator off, remove the stack from the thruster, and remove the horn from the stack. Reinstall the transducer-booster assembly in the thruster and turn the generator on. Repeat Steps 2 through 4.

   If the assembly passes with the horn removed, the horn is outside the specifications required for operation with the Digi-Trac preset range. Reassemble the horn to the stack.

   In ***iQ Explorer II***, checking the Enable Advanced Settings box and then clicking the Advanced button within the Process Settings tab provides access to features designed for unique horns and applications. See Figure 7-4.

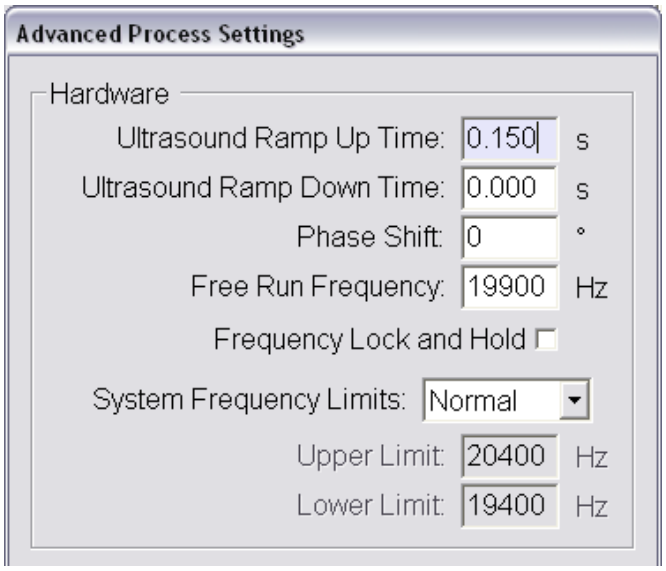
Advanced Process Settings
Hardware
Ultrasound Ramp Up Time: 0.150 s
Ultrasound Ramp Down Time: 0.000 s
Phase Shift: 0 °
Free Run Frequency: 19900 Hz
Frequency Lock and Hold
System Frequency Limits: Normal
Upper Limit: 20400 Hz
Lower Limit: 19400 Hz

Figure 7-4 ***iQ Explorer II***, Process Settings . Enable Advanced Settings

Consult Dukane Corporation before making adjustments to these settings.

If any failure indications are present with the horn removed, check the booster and the transducer for the following

- Any visible damage
- Loose or cracked stud
- Pitted or dirty mating surfaces

Make any necessary repairs or adjustments.

Go to Step 7.

7. Repeat Steps 1 through 6.
   - If the failure indications disappear, reassemble the horn to the acoustic stack and repeat Steps 2 through 4.
   - If any failure indications are still present, do not run this stack. Return the transducer and booster to Dukane for analysis.

Cycling the System

1. Check that you have correctly performed the following:
   a) Installed the acoustic stack in the thruster and bolted the stack access cover closed.
   b) Secured the fixture in place.
   c) Performed the *Operational Test of the Acoustic Stack* as detailed on Page 86 of this section.
2. Verify that all controls on the press/thruster and the generator are set as required for this operation.
3. Place a part in the fixture.
4. Cycle the system.

   Activate both operate switches at the same time to start the system, and hold fingers in place until the ultrasound starts. Releasing the fingers before ultrasound starts will abort the cycle.

Restoring Factory Defaults

The servo press systems has a means of restoring all programmable parameters to factory defaults, which is intended to assist in troubleshooting or correcting unintended parameter changes. Once the restore process is completed and a weld cycle is run with the default parameters, the press should perform a very short-stroke weld motion.

To restore factory defaults in ***iQ Explorer*** or ***iQ Explorer II***, perform these steps:

1. Select the System tab.
2. Press OK on the WARNING message that appears.
3. Press the Restore Factory Defaults button.
4. Press YES to confirm the action.

To restore factory defaults on a generator with a color front panel display, perform these steps:

1. Navigate to the Main Menu.
2. Select Utilities/Hardware.
3. Select Hardware Setup.
4. Scroll to Restore Factory Defaults.
5. Select Restore Defaults.
6. Select YES to confirm the action.

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SECTION 8

Maintenance

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Stack Maintenance

Inspection of the Acoustic Stack Components

It is essential that the mating faces between an ultrasonic transducer/booster and a booster/horn be absolutely flat and parallel. If there is any air gap, there will be a loss in power output and efficiency. Coupling may be so poor as to prevent the startup of vibration from the stack due to the excessive power draw at the mating surfaces.

The condition of excessive crowning, or uneven contact surfaces, is normally made evident by a burnished appearance around the bolt hole areas of the contact surfaces. This condition indicates that contact between the parts occurs only at the burnished areas and not across the full faces of the mating surfaces. (See Figure 8-1.)

The following flatness tolerances are specified for Dukane transducers, boosters, and horns used in 20 kHz applications:

Transducer	.0005 inch
Booster	.0005 inch
Horn	.0005 inch

To check if there may be a flatness problem, first disassemble the stack and look at the mating surfaces. If there are burnished areas at the periphery of a contact surface, that surface may be crowned in the center. Place a straight edge along the face. Refer to Figure 8-2. If light can be seen along the edges, it is crowned.

The surface may also be depressed in the bolt area. Refer to Figure 8-3. In this case, there will be contact only at the peripheral edges and light will be visible beneath the straight edge in the center region.

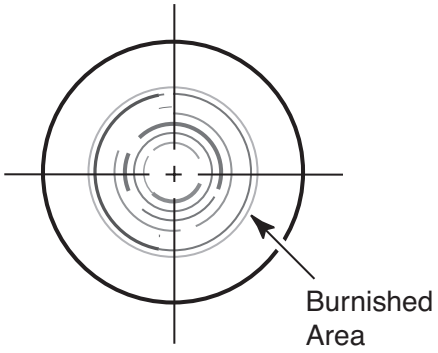

Figure 8-1 Example of Burnished Area

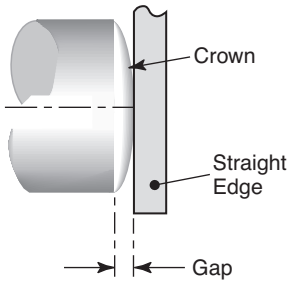

Figure 8-2 Example of Crowning

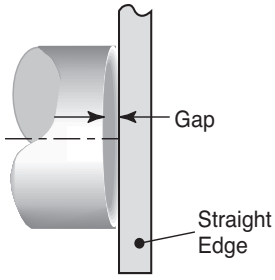

Figure 8-3 Example of Center Depression

Reconditioning Stack Components

To restore the interface to the proper condition, do the following:

1. Disassemble the transducer/booster/horn stack and wipe interfaces with a clean cloth or paper towel.
2. Examine all interfaces. If any interface is corroded or shows a dark, hard deposit, it should be reconditioned.
3. If the interfaces appear to be in good condition, go to Step 11.
4. If necessary, remove the mounting studs.
5. Tape a clean sheet of #400 grit (or finer) silicon carbide wet-or-dry paper to a clean, smooth, flat surface. A piece of plate glass is usually suitable.
6. Hold the part to be conditioned at its lower end with your thumb over a spanner wrench hole. Carefully stroke the part **once** in one direction (toward you) across the abrasive paper, as shown in Figure 8-4. Do not apply downward pressure. The component's weight alone provides sufficient pressure. Perform a second stroke.
7. Rotate the part 120° (1/3 rotation) to the next spanner wrench hole. Repeat the procedure outlined in Step 6.
8. Rotate the part the remaining 120° and repeat. Be certain to perform the same number of strokes at each orientation: Two strokes per rotation.
9. Before reinserting a stud in any horn, perform the following for proper engagement of the threads:
   a) Visually inspect and clean the stud.
   b) Clean the threaded hole using a clean cloth or towel.
   c) Tighten the stud to the torque specifications listed in Table 4-I.

NOTE

The operating efficiency of the equipment will be greatly affected if the mating interfaces of the transducer/booster/horn stack are not flat, make poor contact with each other, or become corroded. A poor contact condition wastes power output, makes tuning difficult, can affect the noise level, and can cause possible heat damage to the transducer.

CAUTION

Use extreme care to avoid tilting the part. Loss of flatness of interface surfaces may render the welding system inoperative.

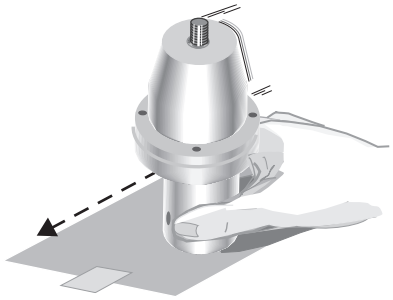

Figure 8-4 Method of Component Resurfacing

CAUTION

Use extreme care to avoid multiple strokes at each 1/3 rotation of the part. Loss of flatness and perpendicularity of the interface surface to the centering axis of the part may render the welding system inoperative.

Continued

Continued from Previous Page

Reconditioning Stack Components

10. Reexamine the interface surface and repeat Steps 6 through 9 until most of the contaminate has been removed. This should not take more than 2 or 3 complete rotations of the part being reconditioned.

11. Reassemble and install the stack, using the procedure in Section 7 of this manual. Recheck the power supply tuning. See ***Section 7, System Operational Test***.

Torque Values

See ***Section 4, Stack/Fixture Setup*** for torque values:

Table 4-I - Stud Torque Values

Table 4-II - Horn/Booster Torque Values

Table 4-III - Replaceable Tip Torque Values

NOTE

Thread deformation may occur if the studs are overtightened. Removal of the stud could damage the threads in the horn. If this occurs, re-tap the horn threads and replace the stud with a new one. Use studs recommended by Dukane.

NOTE

Overtightening stack components may result in horn/booster studs loosening and cause ultrasound overloads.

System Maintenance

Sheet Metal Covers

The covers on the generator, press, and remote controller (if present) are formed to prevent access to internal components. Keep the covers on at all times due to the presence of high voltages and moving components, which could cause injury. The internal generator case also contains capacitors, which continue to hold a high electric charge even after the power is shut off.

Air Ventilation Slots

Ventilation intake and exhaust slots exist on the generator, press, and remote controller (if present). Keep all ventilation slots free from obstructions. If excessive dust or dirt collects on the slots, wipe or vacuum them clean. Do not use compressed air to clean them as this may force the dirt inside the chassis.

Allow 5 inches (127 mm) of clearance outside each ventilation slot.

AC Power Cord

The AC power cords should be kept in good condition and free from any cuts. The AC plugs should be straight with no bent prongs.

Dovetail Slide on Thruster Support

On stand-alone systems with press models, 43S245-A2 and 43S245-A4, the press support column components have an anodized coating. Lubrication on these columns is not necessary.

On systems with press models 43S215, 43S220, and 43S340, the dovetail slide on the column is lubricated. Clean and lubricate the dovetail slide regularly. See Figure 8-5. Use the two slide grease fittings to supply lubricant. For medical applications, the option of using food-grade lubricant may be required.

WARNING

Never operate the generator, press or remote controller with any covers off. This is an unsafe practice and the high voltage and moving elements present may cause injury.

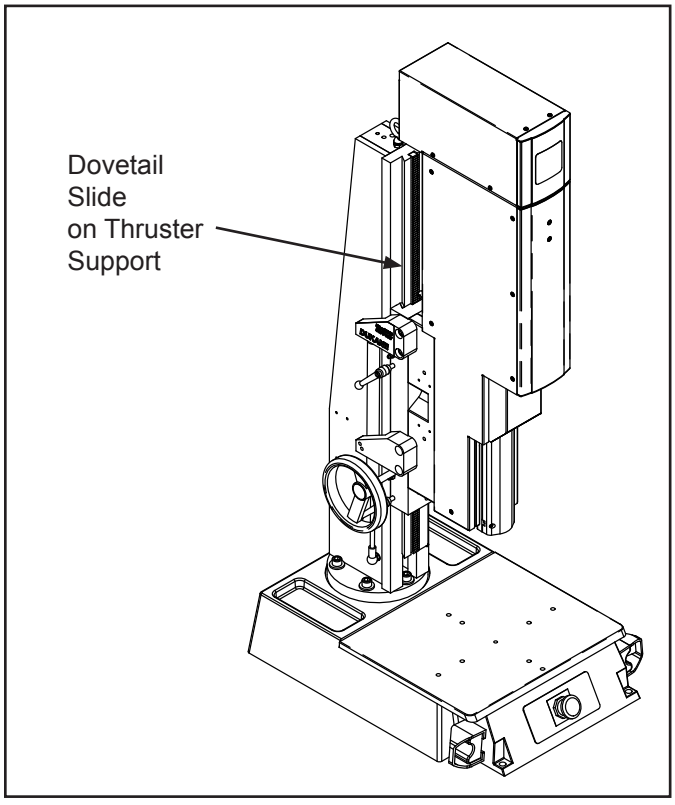

Figure 8-5 Dovetail Slide

Continued

Six-Month Periodic Maintenance

1. Disconnect the generator AC power cord from the AC line receptacle and the AC power cord from the thruster (thruster models 43S220 and 43S340) or remote controller (thruster models 43S215 and 43S245-AX). Then, remove the thruster left and right side covers.

2. Check if any fasteners are visibly loose. If so, contact Dukane for the proper tightening torque.

3. Wipe or blow away all dirt and grease in the thruster.

4. No air is required for the normal operation of a servo press. However, there may be a time when optional cooling accessories were added. This optional cooling could produce excess oil and dirt accumulation.

   Wipe away all excess oil and any dirt accumulation, especially at the exhaust openings in the transducer housing. There should be very little, if any, oil accumulation at the air exhaust opening. If oil accumulation is excessive, route the air for the press/thruster through an “oil mist reclassifier”.

5. Ensure that all wire and cable connections are secure in the thruster and are not rubbing or showing wear. If they do show wear or rubbing then reroute to eliminate the problem.

6. Remount and secure the thruster covers and reconnect the generator, press, and remote controller AC power cords to the AC line receptacles.

Continued

Press Calibration

All models of the ***iQ*** Servo Press are equipped with a force sensor and a linear distance encoder.
When a new press is built at the Dukane factory, the following parameters are either calibrated or verified to perform within a set of accuracy limits:

- Force
- Distance
- Average Speed (without thrust load)

It is recommended that the performance of the above parameters be checked and adjusted (if necessary) on a periodic basis. Dukane offers calibration services either on-site or at the Dukane factory, as well as packages that allow end-users to perform the calibration themselves. Please contact Dukane for more details on these offerings.

SECTION 9

Troubleshooting

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Overview

The Troubleshooting section of this manual contains a listing of problems that may occur when using this equipment along with probable causes and recommended solutions for the problems.

Primary Weld Characteristics

Primary weld characteristics refers to methods used to control the welding process. The characteristics include Time, Distance, Absolute Distance, Energy, and Peak Power.

Welding

Problem

Flash (*See also* Non-uniform welding)

Probable Cause	Solution
Energy director is too large.	Reduce the size of the energy director. Reduce the weld distance/primary weld characteristic. Use an interrupted energy director.
Shear interference is too great.	Reduce the amount of interference.
Weld time is too long.	Reduce the weld distance/primary weld characteristic. Increase weld speed.
Non-uniform joint dimensions.	Re-dimension the joint. Redesign the joint to be a shear joint or a tongue-in-groove joint. Contact Dukane's Applications Lab. Check the molding conditions.
Part fit or tolerances.	Loosen the part fit. Tighten the part tolerances.

Problem

Misalignment of the welded assembly

Probable Cause	Solution
Parts are not self-aligning.	Design a means of alignment into the tooling (fixturing). Add a means of alignment (e.g., pins and sockets) to the mating part halves.
Improper support in the fixture.	Redesign the fixture for proper support.
Wall flexure.	Add ribs or gussets to the part. With a resilient fixture, if large sections of urethane are deflecting, add a rigid backup.
Joint design is not properly dimensioned.	Re-dimension the parts.
Incorrect part tolerance/poor molding.	Tighten the part tolerance. Check the molding conditions.

Continued

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Welding

Problem

Internal components are welding together.

Probable Cause	Solution
The internal components are made of the same material.	Make the internal components out of different materials. Carefully lubricate the internal parts. Use less horn amplitude by changing to a lower gain booster.
Part fit or tolerances.	Increase part clearances. Tighten the part tolerances.

Problem

Diaphragm Damage

Probable Cause	Solution
Excessive horn amplitude.	Reduce the horn amplitude. Dampen the welding area to absorb the excessive vibrations.
Excessive exposure to ultrasound.	Reduce the weld duration and increase the horn amplitude and/or weld speed.
Improper gate location/design/thin-wall sections.	Check gate placement. Change the shape of the gate. Add stiffening ribs to the part. Increase the thickness of the material on the underside of the gate area. If using a 20 kHz system, consider using a 30 kHz or 40 kHz system. If using a 15 kHz system, consider using a 20 kHz system.
The type of horn and/or its placement.	Check for the proper horn/part fit. Change the horn.

Problem

Overwelding

Probable Cause	Solution
Too much energy is being transmitted to the part.	Reduce the trigger force. Reduce the weld duration/primary weld characteristic. Reduce amplitude setting. Change to a lower gain booster to reduce the horn amplitude.

Continued

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Welding

Problem

Internal components of work piece damaged during welding.

Probable Cause	Solution
Excessive horn amplitude.	Reduce the horn amplitude by decreasing the amplitude setting or changing to a lower gain booster. Dampen the excess horn amplitude.
Excessive exposure to ultrasound.	Reduce the primary weld duration and increase the horn amplitude and/or weld speed .
Too much energy transmitted into the part.	Reduce the horn amplitude. Reduce the weld duration/primary weld characteristic. Increase weld speed.
The components are improperly mounted (e.g., parts are mounted too close to the joint area).	Ensure that internal components are mounted properly. Isolate internal components from the part. Move the internal components away from areas of high energy. Use an external device to dampen energy locally.

Problem

Melting or fracturing of the part (outside of the joint area).

Probable Cause	Solution
Sharp internal corners/thin sections.	Radius all sharp corners. Dampen motion for any damaged area, if possible.
Excessive horn amplitude.	Reduce the horn amplitude by decreasing the amplitude setting or changing to a lower gain booster.
Long weld duration.	Decrease the weld duration, increase the horn amplitude and/or the weld speed.
Inherent part stress.	Check the molding conditions. Check the part design. Reduce the horn amplitude.

Continued

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Welding

Problem

Underwelding.

Probable Cause	Solution
Insufficient energy is being transmitted to the part.	Increase the trigger force. Reduce weld speed. Increase the weld duration/primary weld characteristic. Increase the horn amplitude by increasing the amplitude setting or changing to a higher gain booster. Use a higher power capacity assembly system.
Energy is being absorbed into the fixture.	Change the type of fixture being used.

Problem

Uneven welding.

Probable Cause	Solution
Warped part(s).	Check part dimensions. Check the molding conditions. Use a higher trigger force. Increase dynamic hold distance. Increase static hold time.
The energy director varies in height.	Redesign the energy director to ensure uniform height. Use an interrupted energy director.
Lack of parallelism between the horn, the fixture, and the part.	Make sure the fixture and part are perpendicular to the horn. Check the part dimensions.
Wall flexure is occurring.	Add ribs to the part. Modify the fixture to prevent outward flexure.
The knockout pin location is in the joint area.	Redesign the part so the knockout pin is not in the joint area (make sure knockout pins are flush with the surface).
There is insufficient support in the fixture.	Redesign the fixture to improve the support in critical areas. Change to a rigid fixture. If large sections of urethane are deflecting with a resilient fixture, add a rigid backup.

Continued

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Welding

Problem

Uneven welding.

Probable Cause	Solution
Part dimensions are incorrect.	Check the part dimensions. Re-dimension the part, if necessary. Check the molding conditions.
The parts are improperly aligned.	Check for part shifting during welding. Check the alignment of mating parts. Check for parallelism of the horn, the part, and/or the fixture.
There is a lack of intimate contact around the joint area.	Check the part dimensions. Check the part tolerances. Check for knockout pin marks in the joint area. Check for misalignment of the mating part halves. Check for sinks.
Non-uniform horn contact is occurring.	Check the fit of the part to the horn. Check for proper support in the fixture.
Mold release is on the joint surface(s).	Clean the mating surfaces.
There is a non-uniform distribution of filler in the plastic material.	Check the molding conditions. Check the mold design.
The joint design is incorrect.	Redesign the joint.
There is a material or resin grade incompatibility problem.	Consult with the resin supplier(s).
There is a regrind problem.	Check with the molder. Check the molding conditions.
There is moisture in the molded parts.	Specify the parts to be "dry as molded". Dry the parts by heating them prior to welding.

Continued

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Welding

Problem

The parts are marking.

Probable Cause	Solution
Insufficient force during welding.	Increase trigger force. Increase weld speed. If using Match Detect, decrease the value of the parameter After Force Decreases By.
The horn heats up.	Check for a loose stud, tighten if loose. Loosen and then retighten the horn tip. (Refer to Section 8). Ensure that the horn and booster are coupling well (Refer to Section 8). Visually check the horn for cracks. Reduce the weld duration.
There are high spots in the part.	Check the part dimensions. Check the fit of the horn to the part.
Use of raised lettering.	Use recessed lettering or relieve the horn around the lettering.
The part does not fit the fixture properly.	Check the fixture for proper support. Check for cavity-to-cavity variations. Redesign the fixture.
Oxide from the horn is being transferred to the part.	Place polyethylene film between the horn and the part. Use a chrome-plated horn and/or fixture.
The parts contain fillers.	Check the processing conditions. Reduce the amount of filler in the plastic.

Problem

Welding process not in control (inconsistent weld results on a part-to-part basis).

Probable Cause	Solution
A mold release agent is used.	Clean the mating surfaces. If a mold release agent is necessary, use a paintable/printable grade.
Incorrect part tolerances.	Tighten the part tolerances. Check the part dimensions. Check the molding dimensions.
There are cavity-to-cavity variations.	Check the part dimensions and tolerances. Check for cavity wear. Check the molding conditions.

Continued

Continued from Previous Page

Welding

Problem

Welding process not in control (inconsistent weld results on a part-to-part basis).

Probable Cause	Solution
Part dimensions vary due to mold cavity variations.	Perform a statistical study to see if a pattern develops with certain cavity combinations.
The resin contains regrind or degraded plastic.	Consult with the molder. Check the molding conditions. Reduce the percentage of regrind. Improve the quality of the regrind.
The plastic's filler content is too high.	Reduce the percentage of filler in the plastic. Check the processing conditions. Change the type of filler (e.g., from short to long glass fibers).
The horn doesn't fit the part correctly.	Check the part dimensions. Check for cavity-to-cavity variations. Obtain a new horn.
There is a lack of parallelism between the horn, part, and/or fixture.	Check for parallelism between the horn, part, and fixture. Check the horn/part fit. Check the part/fixture fit. Level the fixture, where necessary.
Rigid fixture reflects vibratory energy.	Dampen the energy by using teflon, neoprene, cork, or urethane in the nest of the fixture.
Fluctuations in the AC line voltage supplied to the generator.	Upgrade to a generator with line regulation.

Problem

The weld cycle is too long.

Probable Cause	Solution
Excessive distance between the Sensing Start Position and point of contact between horn and part.	Increase Sensing Speed. Reduce distance between the sensing and actual trigger points.

Insertion

Problem

The insert pulls out easily in use.

Probable Cause	Solution
There is insufficient interference between the hole and the insert.	Reduce the size of the molded hole in the plastic.
The screw bottoms out in the hole.	Use a shorter screw. (Applies to internally-threaded insert).
	Deepen the hole.
The insert gets pushed into the plastic before the plastic melts.	Increase the horn amplitude or decrease weld speed. Use pre-triggering.
The ultrasound remains on after insertion is complete.	Decrease the primary weld characteristic.
The horn retracts before the plastic around the insert is solidified.	Increase the hold time.

Problem

Inconsistent insertion of multiple inserts on the same part.

Probable Cause	Solution
The plastic is not melting consistently around all inserts.	Increase the horn amplitude.
Inserts are pushed into the plastic before the plastic has melted.	Check Sensing Start Position and Sensing Speed. Use pre-triggering.
Inserts are seated at different heights within the same part.	Evaluate the support provided by the fixture. If required, re-level or shim the fixture.
	Measure the horn tip length to check for dimensional consistency. If a varying length is found, send the horn to Dukane for modification.

Continued

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Insertion

Problem

The boss or the plastic around the boss cracks after insertion.

Probable Cause	Solution
The insert is pushed in before the plastic has melted.	Reduce the weld speed, or increase horn amplitude. Use pre-triggering.
The boss wall is too thin.	Increase the thickness of the boss wall.
There is too much interference between the insert and the hole.	Increase the hole diameter. Use a smaller insert.

Problem

The insert is not driven to the desired depth.

Probable Cause	Solution
The ultrasound is not on long enough.	Increase the primary weld characteristic. Check the cycle data to see if the desired weld parameters were reached (e.g. Collapse Distance).
Flash fills the hole. (Applies to an internally-threaded insert.)	Increase the depth of the hole.
There is insufficient ultrasonic power.	Increase the horn amplitude or use a more powerful generator.

Problem

The cycle time is too long.

Probable Cause	Solution
There is insufficient ultrasonic power or the generator overloads.	Use a more powerful generator.
There is too much interference between the hole and the insert.	Increase the hole diameter, if possible. Use a smaller insert.
The area of the part being inserted is not being rigidly supported.	Support the part directly under the boss. Install a metal post directly under the part being inserted.

Continued

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Insertion

Problem

Plastic flows over the top of the insert.

Probable Cause	Solution
The weld duration is too long.	Decrease the primary weld characteristic.
The insert is being driven too deep.	Decrease the primary weld characteristic.
There is too much interference between the hole and the insert.	Increase the hole diameter, if possible. Use a smaller insert.

Problem

Melted plastic fills the hole (Applies to internally-threaded inserts).

Probable Cause	Solution
The insert is too long or the hole is too shallow.	Use a shorter insert or make the hole deeper.
There is too much interference between the hole and the insert.	Increase the hole diameter. Use a smaller insert.
The insert is being driven too deep.	Decrease the primary weld characteristic.

Staking

Problem

A ragged or irregularly shaped stake head is formed.

Probable Cause	Solution
The staking cavity is too large.	Change to a smaller cavity in the horn.
The volume of plastic in the stud is insufficient.	Increase the stud height/diameter.
The stud is melting at the base.	See the problem section that follows entitled "The base is melting before the head forms".

Problem

There is excessive flash around the stake head.

Probable Cause	Solution
The staking cavity is too small.	Use a larger cavity in the horn.
The volume of plastic in the stud is excessive.	Decrease the stud height and/or diameter.
The stud is not centered in the horn cavity.	Center the stud under the horn cavity.

Problem

The surface below the stake head is distorted.

Probable Cause	Solution
The part is not supported directly beneath the stud being staked.	Support the fixture with a metal post beneath the stud being staked.
The trigger force is too high.	Reduce the trigger force. Use pre-triggering.

Problem

There is a loose fit between the staked head and the part being attached.

Probable Cause	Solution
The hole diameter relative to the stud diameter is too large.	Reduce the hole diameter. Increase the stud diameter.

Continued

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Staking

Problem

There is a loose fit between the staked head and the part being attached.

Probable Cause	Solution
The holding force was removed before the stud head could solidify.	Increase the dynamic hold distance. Increase Static Hold time. Increase the stud diameter. Reduce the size of the staking cavity.

Problem

The stud is collapsing at its base.

Probable Cause	Solution
There is a sharp corner near the base of the stud.	Radius the stud at the base.
The stud is not centered in the horn cavity.	Center the stud under the horn cavity. Use a knurled tip.
The base is melting before the head forms.	See the problem section below entitled "The base is melting before the head forms".
Too much force is applied before the ultrasound is activated.	Use pre-triggering.

Problem

The base is melting before the head forms.

Probable Cause	Solution
The trigger force is too high.	Reduce the trigger force. Use pre-triggering.
The horn amplitude is insufficient.	Increase the amplitude.

Continued

Continued from Previous Page

Staking

Problem

The formed stud head stays in the staking cavity as the horn retracts.

Probable Cause	Solution
The stud head has not solidified before the horn retracts.	Increase the hold time.
The horn tip is hot and not allowing the stud to solidify.	Cool the horn tip. Use afterburst.

NOTE

The use of a knurled horn tip and a pointed stud can help solve many of the above problems.

Servo Press Alarm Messages

The following table lists alarms that may appear on the servo press systems containing a generator with a color front panel display (Q-Series) or ***iQ Explorer II*** software. For systems containing a generator without a display (A-Series), many of these alarms are indicated as fault or error messages in ***iQ Explorer***.

Information on particular alarms may also be obtained on the Dukane '"Easy Alarm" web page: ***http://www.dukane.com/us/DL_EasyAlarm.asp***

Continued

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Alarm Code	Alarm Message	Explanation	Solution
U100	Configuration Fault	Default Setup corrupted, Model Number incorrect, Serial Number incorrect, Feedback Scaling incorrect, etc.	This is a disabling condition for the generator; contact Dukane.
U101	Bad Parameter Alarm	Internal generator fault.	Contact Dukane.
U102	Watchdog Reset Alarm	Internal generator fault.	Contact Dukane.
U103	Hardware Fault	Hardware configuration or options were changed since last generator power up.	This is a disabling condition for the generator; contact Dukane.
U104	Frequency Overload Fault 1 (PLL Lock Fail)	The generator did not obtain a frequency lock by the end of ramp up period.	Press Test button on the power supply. Verify that the ultrasonic stack will operate in a test condition. Verify that the stack is operating at proper Frequency and Power draw. Reduce trigger pressure, force, and/or down speed. If stack will not operate in test perform stack care and maintenance. Follow this link to stack care and maintenance procedure. If Stack will not operate in test condition, remove horn and re-inspect. Enable "Advanced Process Settings" to adjust free run frequency to the "in air" operating frequency that results from a test. Enabling a pre-trigger source that allows for full ramp-up time to elapse still "in air" before contacting the part should eliminate all "Frequency Overload Fault 1" occurrences for a properly maintained stack. If the above steps do not resolve problem, contact Dukane.
U105	Frequency Overload Fault 2 (PLL Lock Lost)	The stack may be coupling the part to the fixture.	Attempt to decouple vibrations from fixture by using a compliant medium, such as a sheet of silicone or cork, between the part and fixture, or fixture and base.
U106	POS Peak Overload Fault	Generator ultrasound overload.	Check if one of the stack components is defective. Check if one of the stack components is loose. Check if the iQ generator's system frequency settings are set correctly.
U107	NEG Peak Overload Fault	Generator ultrasound overload.	Check if one of the stack components is defective. Check if one of the stack components is loose. Check if the iQ generator's system frequency settings are set correctly.
U108	Average Overload Fault	Generator ultrasound overload.	Reduce the force being applied to the part (on a pneumatic press) or reduce the weld speed (on a servo press).
U109	Bad Current Loop Fault	4-20 mA current loop is not connected to the remote amplitude card, or 4-20 mA current loop is defective (poor electrical).	Check for proper connection to remote amplitude card. Check for damage to wiring. This is a disabling condition for the generator; contact Dukane.

Table 9-I Servo Press Alarm Message Screens - Page 1 of 4

Continued

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Alarm Code	Alarm Message	Explanation	Solution
U110	Power not OK Fault	Problem with incoming AC line voltage.	Verify that the incoming AC Line voltage supplied to the generator is within the range specified for the generator. Consult the manual for your generator
U111	Overtemperature Fault	Generator has exceeded its temperature limit.	Check for blockage of air vents on the sides of the generator, restricting air flow to the inside of the generator. Check if the internal fan is defective.
U112	Frequency Overload Fault 3 (PLL Limit Exceeded)	The operating frequency was artificially bounded by the system frequency limits for 25 consecutive milliseconds. This is usually due to excessive operating frequency drift (operating frequency is "far" from free run frequency) due to heating of the stack.	Execute the following steps to alleviate the problem: Observe the last operating frequency from a test graph. Enable "Advanced Process Settings". Change "System Frequency Limits" to "Manual" and adjust the offending upper/lower frequency limit to an acceptably safe value for your horn/stack/application. Often as a horn/stack heats up, it may begin to have trouble starting (Frequency Overload Fault 1) because the operating frequency is drifting away from the generator's Free Run Frequency setting. Adjusting the Free Run Frequency may also be advisable. A sudden shift in frequency (as observed on the graph) immediately before a Frequency Overload Fault 3, as opposed to a general frequency drift, indicates stack/horn coupling to the part during the weld or an another abrupt change in stack resonance. This does not imply an operating frequency drift issue, but a weld application setup issue.
U200	Servo Controller Fault	One of several possible problems detected on servo controller.	Cycle power on the generator. If alarm persists, contact Dukane.
U201	Force Duration Exceeded	Large amount of force was applied for an excessive amount of time while jogging.	Cycle power on the generator. Do not apply large force for long periods of time while in jog mode.
U202	Position Error Limit Exceeded	Servo press was not able to complete the programmed motion due to reaching its maximum force capability.	Decrease trigger force, weld and/or hold speed(s). Use alternate press model with larger force capacity.
U203	Amplifier Error	Indicates a problem with the servo amplifier.	Cycle power on the generator. If alarm persists, contact Dukane.
U204	Command Error	Servo controller program error.	Cycle power on the generator. If alarm persists, contact Dukane.
U205	Checksum Error	Internal servo controller error.	Cycle power on the generator. If alarm persists, contact Dukane.
U208	Lower Limit Switch Activated	Lower travel limit switch was activated on press.	Jog the press up to avoid contact with the limit switch.

Table 9-I Servo Press Alarm Message Screens - Page 2 of 4

Continued

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Alarm Code	Alarm Message	Explanation	Solution
U209	Upper Limit Switch Activated	Upper travel limit switch was activated on press.	Jog the press down to avoid contact with the limit switch.
U210	Servo HW Test Failed	A failure has been detected during the servo hardware test, which is performed at system startup or reset.	Press any key on generator color display for additional failure details. Check that servo AC breaker is on and the servo power LED on the press is lit. Check that all cables are connected securely. Check for any damage to connector pins. If alarm persists, contact Dukane.
U211	Servo Overtemperature Fault	The servo actuator temperature has exceeded 100° C.	Turn servo press off, wait for actuator to cool down, then resume operation. Increase time between cycles to prevent excessive heating.
U212	Servo Travel Limit Exceeded	Servo press has reached the defined maximum travel limit.	Increase the maximum travel limit position. Adjust weld parameters to reduce the distance traveled during the weld and hold.
U213	Servo Communication Error	Communication between the servo controller and the motherboard has been compromised.	Contact Dukane.
U214	Obstruction at Top of Stroke	The press is unable to reach the Top-of-Stroke position.	Remove obstruction detected at Top of Stroke. Adjust Top of Stroke position to be defined higher than obstruction.
U216	Excessive Force at Idle	The press system senses an excessive amount of force when idle.	This alarm can occur when an ultrasonic stack is removed from the press when power is on. Be sure to turn system power off when disassembling and reassembling the stack. If alarm appears when not changing stacks, contact Dukane.
U217	Excessive Deviation from TOS	The press position deviated excessively from the defined Top-of-Stroke position when idle.	Contact Dukane.
U218	Servo Encoder Failure	The press system detected a problem with the linear position encoder.	Contact Dukane.
U300	Operate Switch 1 Pressed before Cycle Start		Release Switch 1 before pressing both activation switches to start a cycle. Verify wiring of both switches.
U301	Operate Switch 2 Pressed before Cycle Start		Release Switch 2 before pressing both activation switches to start a cycle. Verify wiring of both operating switches.
U302	Auto In Switch closed at End of Cycle		Remove active Auto-In signal. Verify wiring to Auto-In signal.

Table 9-I Servo Press Alarm Message Screens - Page 3 of 4

Continued

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Alarm Code	Alarm Message	Explanation	Solution
U308	Generator or Press Not Ready	iQ generator initialization process is not complete.	Wait for initialization process to complete. Cycle power on iQ generator. If alarm persists, contact Dukane.
U400	Weld Limits enabled for continuous operation		Change Weld Mode from Automation. Disable Weld Method.
U401	Weld Time set to Zero		Adjust weld time to be greater than zero.
U402	Weld Power set to Zero		Adjust weld peak power to be greater than zero.
U403	Weld Energy set to Zero		Adjust weld energy to be greater than zero.
U404	Weld Distance set to Zero		Adjust weld distance to be greater than zero.
U405	Weld Position set to Zero		Adjust weld position to be greater than zero.
U406	Max Trigger Time set to Zero		Adjust maximum trigger time to be greater than zero.
U407	Forced Shutdown Alarm	External command was received by generator to end weld cycle.	This alarm is for information only.
U410	Pre-trigger Overtravel Alarm	Press travel exceeded fixed distance limit while ultrasound was active.	For servo press the distance from pre-trigger to position of trigger is required to be less than 0.25 inches or 6.35 millimeters. For pneumatic press the distance from pre-trigger to position of trigger is required to be less than 0.75 inches or 19.05 millimeters.
U411	Part Detected Too Early	Contact between the horn and part was detected before reaching the Sensing Start Position.	Adjust Sensing Start Position to be above contact with part. Account for variation of heights of unassembled parts. NOTE: Repeated occurrences of this alarm may result in costly damage to servo actuator.
U413	Max Trigger Time Exceeded	Trigger did not occur within the specified time limit.	Increase maximum trigger time. Start the weld process sooner.
U414	Max Trigger Delay Time Exceeded	Trigger delay distance was not reached within the specified time limit.	Increase maximum trigger delay time. Start the weld process sooner.
U500	Servo Must Be Homed	The servo press must complete the homing process before operation is allowed.	Home the servo press by activating both operating switches.
U501	End of Weld Signal Detected	When Auto-stop is enabled and set for End of Weld, this alarm indicates that the signal has been detected.	This alarm is for information only.
U502	End of Cycle Signal Detected	When Auto-stop is enabled and set for End of Cycle, this alarm indicates that the signal has been detected.	This alarm is for information only.

Table 9-I Servo Press Alarm Message Screens - Page 4 of 4

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SECTION 10

Contacting Dukane

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Contacting Dukane

Identify Equipment

When contacting Dukane about a service–related problem, be prepared to give the following information:

- Model and serial numbers of the press and generator.
- Fault/error/alarm indicators from the generator display or ***iQ Explorer/ iQ Explorer II*** software.
- Software versions. (On generators with a display, go to Main Menu and press Help.

  On generators without a display, go to Hardware tab in ***iQ Explorer/iQ Explorer II***).
- Problem description and steps taken to resolve it.
- Line voltage(s) for press and generator.

Many problems can be solved over the telephone, so it is best to call from a telephone located near the equipment.

Intelligent Assembly Solutions

Mailing Address: Dukane Ultrasonics
2900 Dukane Drive
St. Charles, IL 60174 US

Phone: (630) 797–4900

E-mail: **ussales@dukane.com**

Fax:

Main (630) 797–4949

Service & Parts (630) 584–0796

Website

The website has information about our products, processes, solutions, and technical data. Downloads are available for many kinds of literature.

Here is the address for the main website:

www.dukane.com/us/

You can locate your local representative at:

www.dukane.com/us/sales/intsales.htm

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SECTION 11

Specifications

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Compressed Air Requirements. 130
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Press Specifications

Model Number	Stroke		Maximum Weld Force		Maximum Rapid Speed		Linear Encoder Resolution		Maximum Horn Weight	
	in	mm	lb	kg	in/s	mm/s	in	µm	lb	kg
43S215	5.0	127	1000	455	7.0	178	0.00004	1.0	60	27
43S220	5.0	127	550	250	3.0	76	0.00004	1.0	15	7
43S245-A2	3.5	89	150	68	4.9	124	0.00004	1.0	4.0	1.8
43S245-A4	3.5	89	90	41	7.9	200	0.00004	1.0	2.0	0.9
43S340	5.0	127	150	68	5.5	140	0.00004	1.0	6.0	2.7

Table 11-I Press Specifications

Weights

Model Number	Press (includes thruster, base and column)		Thruster Only		Remote Controller	
	lb	kg	lb	kg	lb	kg
43S215 *	325	148	115	52		
43S220 *	283	129	73	33		
43R215					25	11
43S340 *	276	125	66	30		
43S245-A2 *	230	105	32	15		
43S245-A4 *						
43R245					20	9

Table 11-II Weights

*** Shipping**: Add 145 pounds (66 kg) to unit weight for packing materials

Dimensions

Dimensions - in (mm)

Model Number	Press (includes base and column)		
	Height	Width	Depth
43S215	61 (1550) highest 46.5 (1180) lowest	19.9 (507)	24.8 (630)
43S220	70.1 (1780) highest 49.1 (1250) lowest		
43S340			
43S245	44.5 (1130) highest 36.0 (915) lowest		

Table 11-III Dimensions

NOTE

Add 6" (150 mm) behind the press/thruster for connection of cables and optional cooling air tube.

NOTE

Press height for a particular application is typically driven by the horn length and the required clearance between the horn and the fixture for part loading and unloading.

Operating Environment

Operate the equipment within these guidelines:

Temperature: 40°F to 100°F (+5°C to +38°C)

Air Particulates: Keep the equipment dry.
Minimize exposure to moisture, dust, dirt, smoke and mold.

Humidity: 5% to 95% Non–condensing @ +5°C to +30°C

Nonoperating storage guidelines:

Temperature: -4°F to 158°F (-20°C to +70°C)

Air Particulates: Keep the equipment dry.
Minimize exposure to moisture, dust, dirt, smoke and mold.

Humidity: 5% to 95% Non–condensing @ 0°C to +30°C

AC Power Requirements

Generator

The AC line voltage and current needed depend on whichever generator has been chosen for your system. See the table below.

Operating Frequency	Generator Model Number	Overload Power Ratings (Watts)	Input AC Power Requirements Nominal AC Volt @ Maximum RMS Current	North America/ Japan AC Outlet Rating
15kHz	15HS360-2♦-XX-XX	3600	200-240V 50/60 Hz @ 25 Amps	30 Amps
15kHz	15HS480-2♦-XX-XX	4800	200-240V 50/60 Hz @ 30 Amps	
20kHz	20HS120-1♦-XX-XX	1200	100-120V 50/60 Hz @ 15 Amps	15 Amps
20kHz	20HS120-2♦-XX-XX	1200	200-240V 50/60 Hz @ 8 Amps	
20kHz	20HS180-2♦-XX-XX	1800	200-240V 50/60 Hz @ 12 Amps	
20kHz	20HS240-2♦-XX-XX	2400	200-240V 50/60 Hz @ 15 Amps	
20kHz	20HS360-2♦-XX-XX	3600	200-240V 50/60 Hz @ 25 Amps	30 Amps
20kHz	20HS480-2♦-XX-XX	4800	200-240V 50/60 Hz @ 30 Amps	
30kHz	30HS090-1♦-XX-XX	900	100-120V 50/60 Hz @ 8 Amps	15 Amps
30kHz	30HS090-2♦-XX-XX	900	200-240V 50/60 Hz @ 8 Amps	
30kHz	30HS120-1♦-XX-XX	1200	100-120V 50/60 Hz @ 15 Amps	
30kHz	30HS120-2♦-XX-XX	1200	200-240V 50/60 Hz @ 8 Amps	
30kHz	30HS180-2♦-XX-XX	1800	200-240V 50/60 Hz @ 12 Amps	
40kHz	40HS060-1♦-XX-XX	600	100-120V 50/60 Hz @ 8 Amps	
40kHz	40HS060-2♦-XX-XX	600	200-240V 50/60 Hz @ 5 Amps	
40kHz	40HS090-1♦-XX-XX	900	100-120V 50/60 Hz @ 15 Amps	
40kHz	40HS090-2♦-XX-XX	900	200-240V 50/60 Hz @ 8 Amps	
40kHz	40HS120-1♦-XX-XX	1200	100-120V 50/60 Hz @ 15 Amps	
40kHz	40HS120-2♦-XX-XX	1200	200-240V 50/60 Hz @ 8 Amps	

Table 11-IV Generator AC Power Requirements

NOTES:

An X used above in the Model Numbers is a “wildcard” character meaning any valid character code combination.

Maximum line current requirement is specified at the minimum nominal AC line voltage and the rated power level.

♦ = designation for the front panel series - "A" = a blank panel, or "Q" = a color front panel.

Continued

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Remote Controller

The AC line voltage and current needed depend on whichever remote controller has been chosen for your system. See the table below.

Model Number	Input AC Power Requirements Nominal AC Voltage @ Maximum RMS Current	North America/ Japan AC Outlet Rating
43R215	200-240V 50/60 Hz @ 10 Amps	15 Amps
43R245-AX	90-240V 50/60 Hz @ < 5 Amps	15 Amps

Table 11-V Remote Controller AC Power Requirements

Press **

The AC line voltage and current needed for your system is shown in the table below.

Model Number	Input AC Power Requirements Nominal AC Voltage @ Maximum RMS Current	North America/ Japan AC Outlet Rating
43S220, 43S340	90-240V 50/60 Hz @ < 5 Amps	15 Amps

Table 11-VI Press AC Power Requirements

***Power to the press for models 43S215 and 43R245-AX is supplied by the remote controller.*

Compressed Air Requirements

Ultrasonic stacks will create heat in high duty cycle applications and will require external air cooling.

Air requirements will depend upon the duty cycle of the application.

Dukane recommends that you use regulated clean, dry air necessary to maintain the ultrasonic stack at a proper operating temperature below 110°F.

Air fittings are provided on the back of most thruster units. Compressed air supplied to these fittings is directed at the transducer housing inside the thruster.

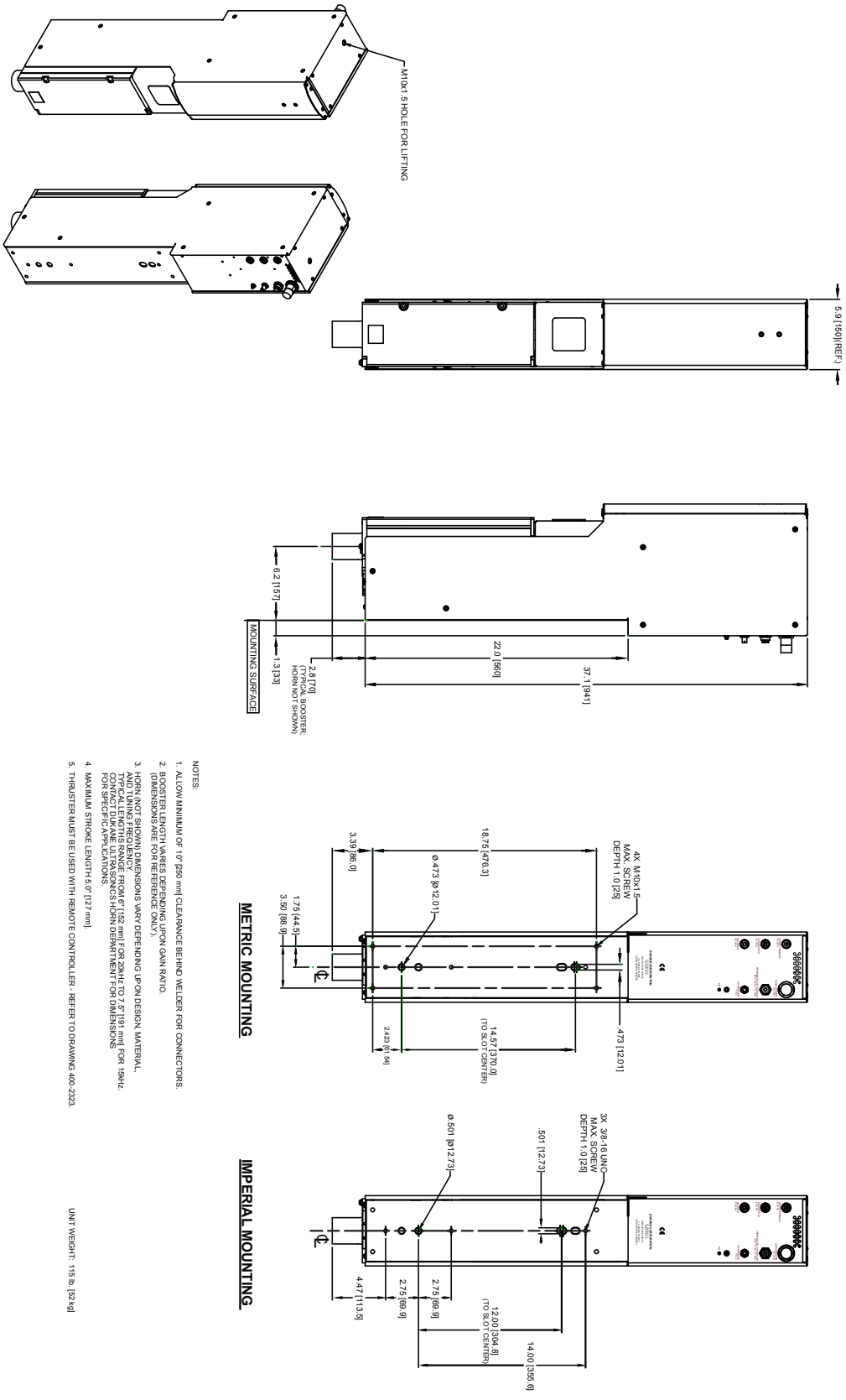


Figure 11-1 Layout - 15/20 kHz High Power ***iQ*** Servo Thruster 43S215 - Drawing: 400-2321

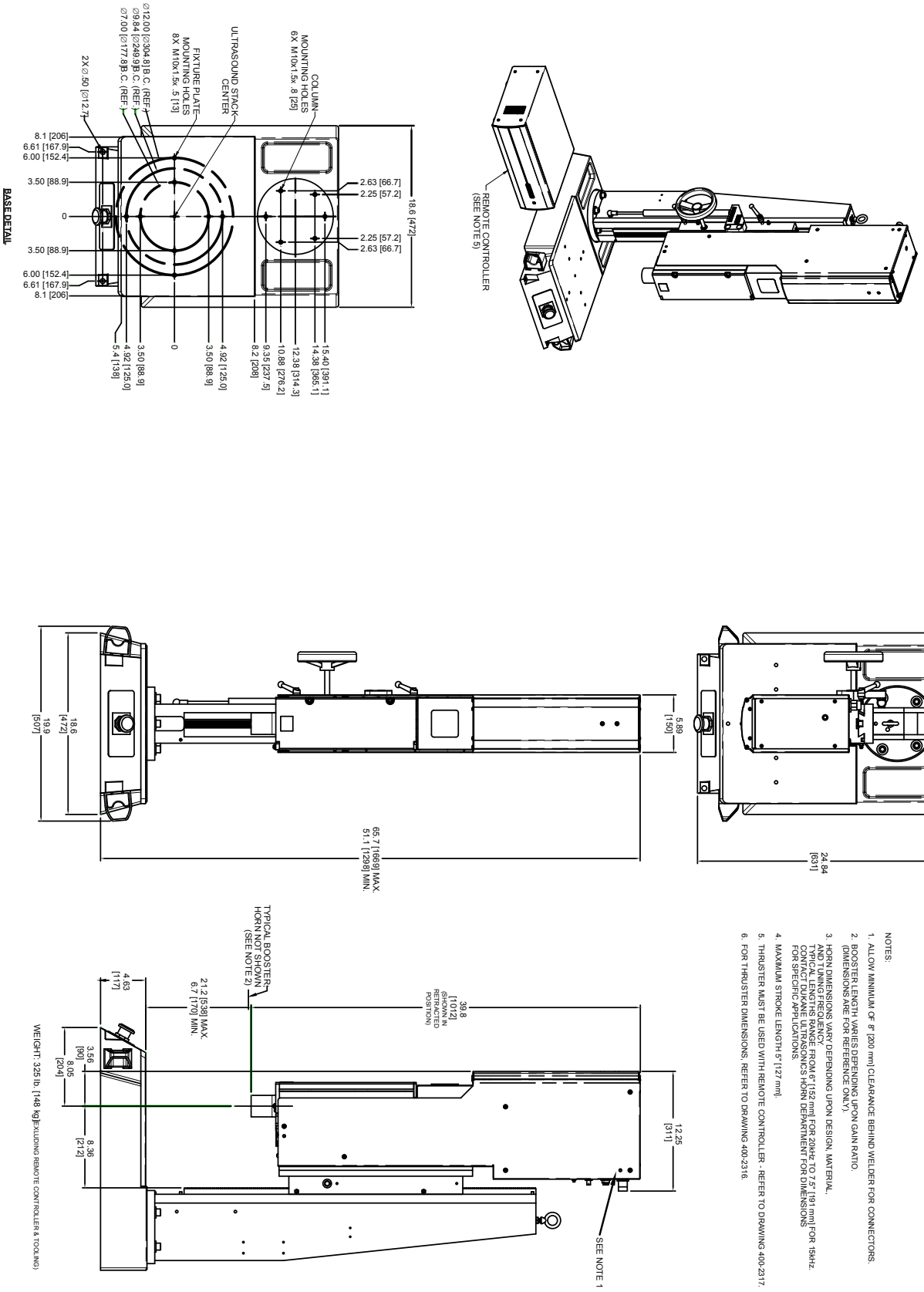

BASE DETAIL
2X ⌀.50 [⌀12.7]
⌀12.00 [⌀304.8] B.C. (REF.)
⌀9.84 [⌀249.9] B.C. (REF.)
⌀7.00 [⌀177.8] B.C. (REF.)
FIXTURE PLATE MOUNTING HOLES 8X M10x1.5x .5 [13]
ULTRASOUND STACK CENTER
COLUMN MOUNTING HOLES 6X M10x1.5x .8 [25]
8.1 [206]
6.61 [167.9]
6.00 [152.4]
3.50 [88.9]
0
3.50 [88.9]
6.00 [152.4]
6.61 [167.9]
8.1 [206]
2.63 [66.7]
2.25 [57.2]
2.25 [57.2]
2.63 [66.7]
18.6 [472]
5.4 [138]
4.92 [125.0]
3.50 [88.9]
0
3.50 [88.9]
4.92 [125.0]
8.2 [208]
9.35 [237.5]
10.88 [276.2]
12.38 [314.3]
14.39 [365.1]
15.40 [391.1]
REMOTE CONTROLLER (SEE NOTE 5)
19.9 [507]
18.6 [472]
5.89 [150]
65.7 [1669] MAX. 51.1 [1298] MIN.
24.84 [631]
TYPICAL BOOSTER HORN NOT SHOWN (SEE NOTE 2)
4.63 [117]
21.2 [538] MAX. 6.7 [170] MIN.
39.8 [1012] (SHOWN IN RETRACTED POSITION)
3.56 [90]
8.05 [204]
8.36 [212]
12.25 [311]
SEE NOTE 1
WEIGHT: 325 lb. [148 kg] EXCLUDING REMOTE CONTROLLER & TOOLING)
NOTES:
1. ALLOW MINIMUM OF 8" [200 mm] CLEARANCE BEHIND WELDER FOR CONNECTORS.
2. BOOSTER LENGTH VARIES DEPENDING UPON GAIN RATIO. (DIMENSIONS ARE FOR REFERENCE ONLY).
3. HORN DIMENSIONS VARY DEPENDING UPON DESIGN, MATERIAL, AND WORKING FREQUENCY. TYPICAL LENGTHS RANGE FROM 6" [152 mm] FOR 20kHz TO 7.5" [191 mm] FOR 15kHz. CONTACT DUKANE ULTRASONICS HORN DEPARTMENT FOR DIMENSIONS FOR SPECIFIC APPLICATIONS.
4. MAXIMUM STROKE LENGTH 5" [127 mm].
5. THRUSTER MUST BE USED WITH REMOTE CONTROLLER - REFER TO DRAWING 400-2317.
6. FOR THRUSTER DIMENSIONS, REFER TO DRAWING 400-2316.

Figure 11-2 Layout - 15/20 kHz High Power *iQ* Servo Press System - Drawing: 400-2324

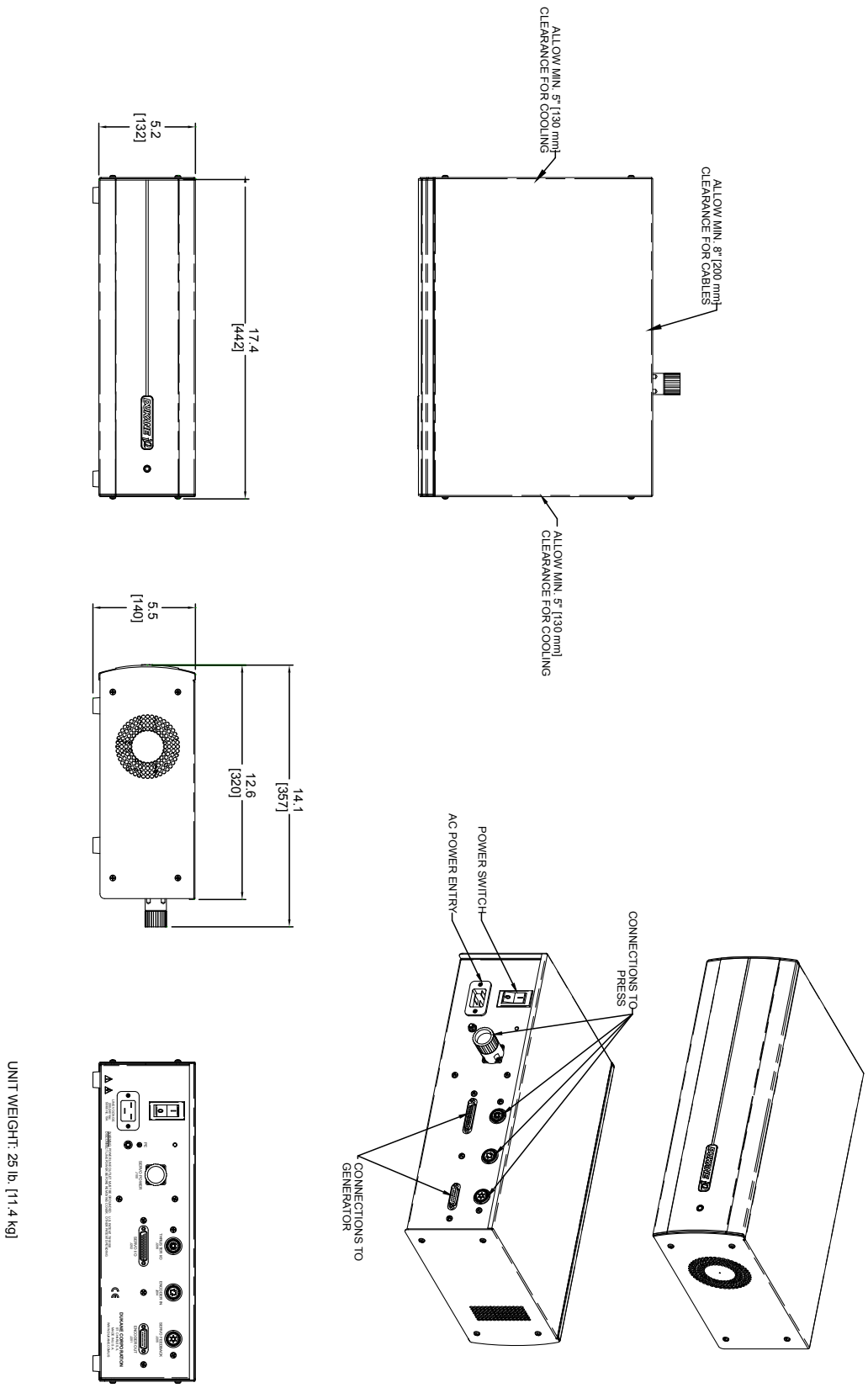


Figure 11-3 Layout - Remote Controller ***iQ*** 15/20 kHz High Power Servo Press (Model 43R215) - Drawing: 400-2323

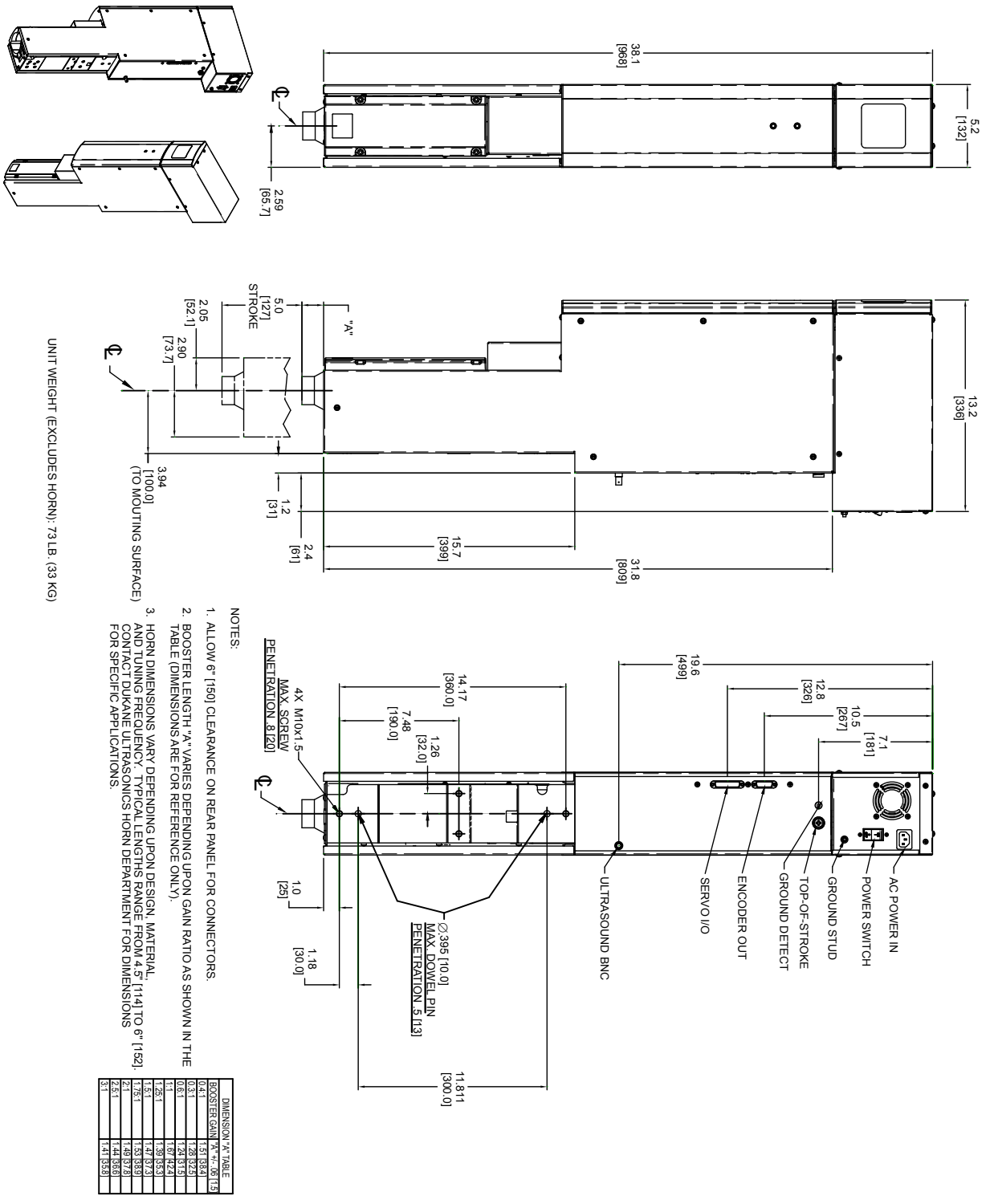


Figure 11-4 Layout - 20 kHz *iQ* Servo Thruster 43S220 - Drawing: 400-2294

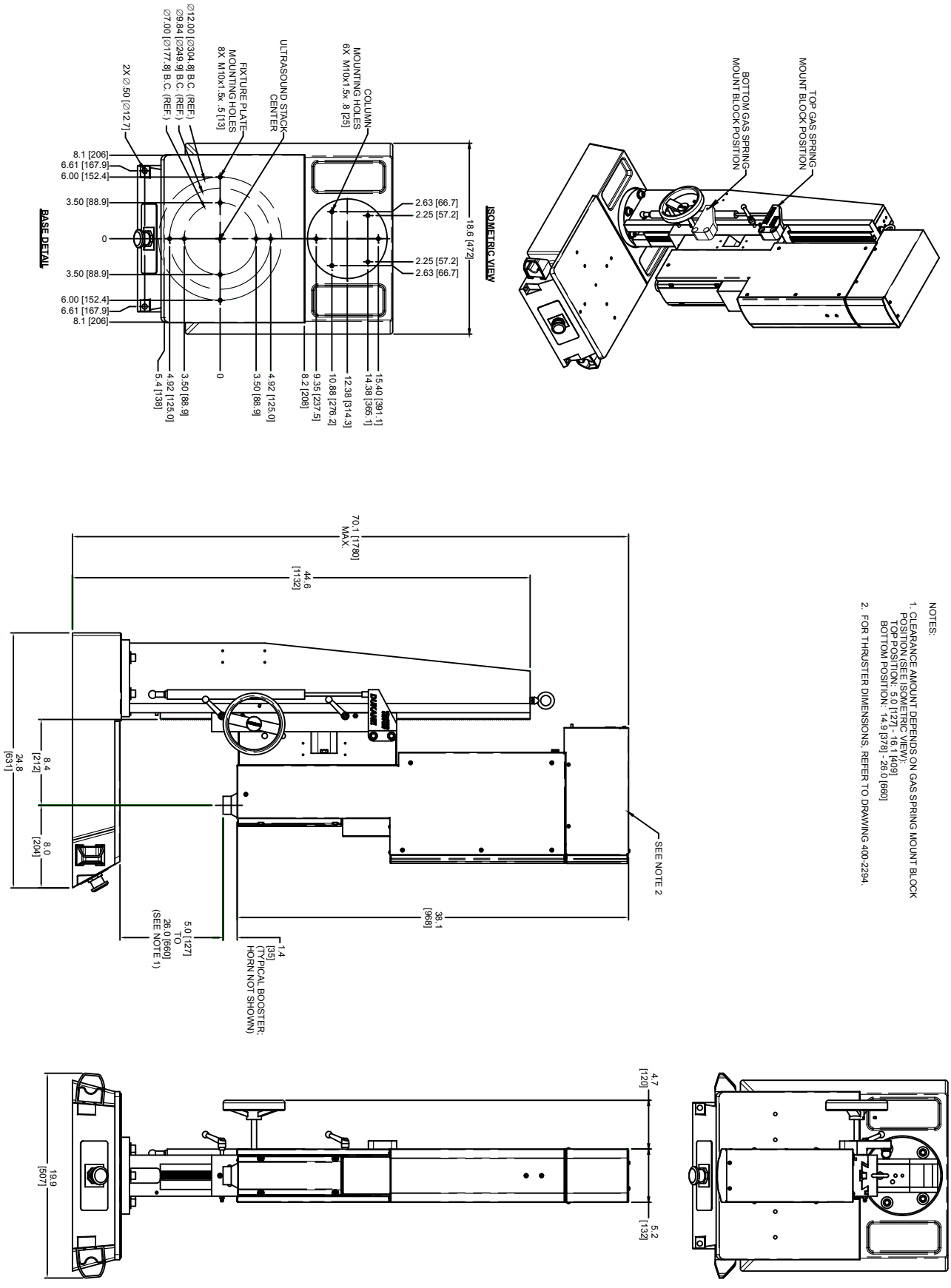
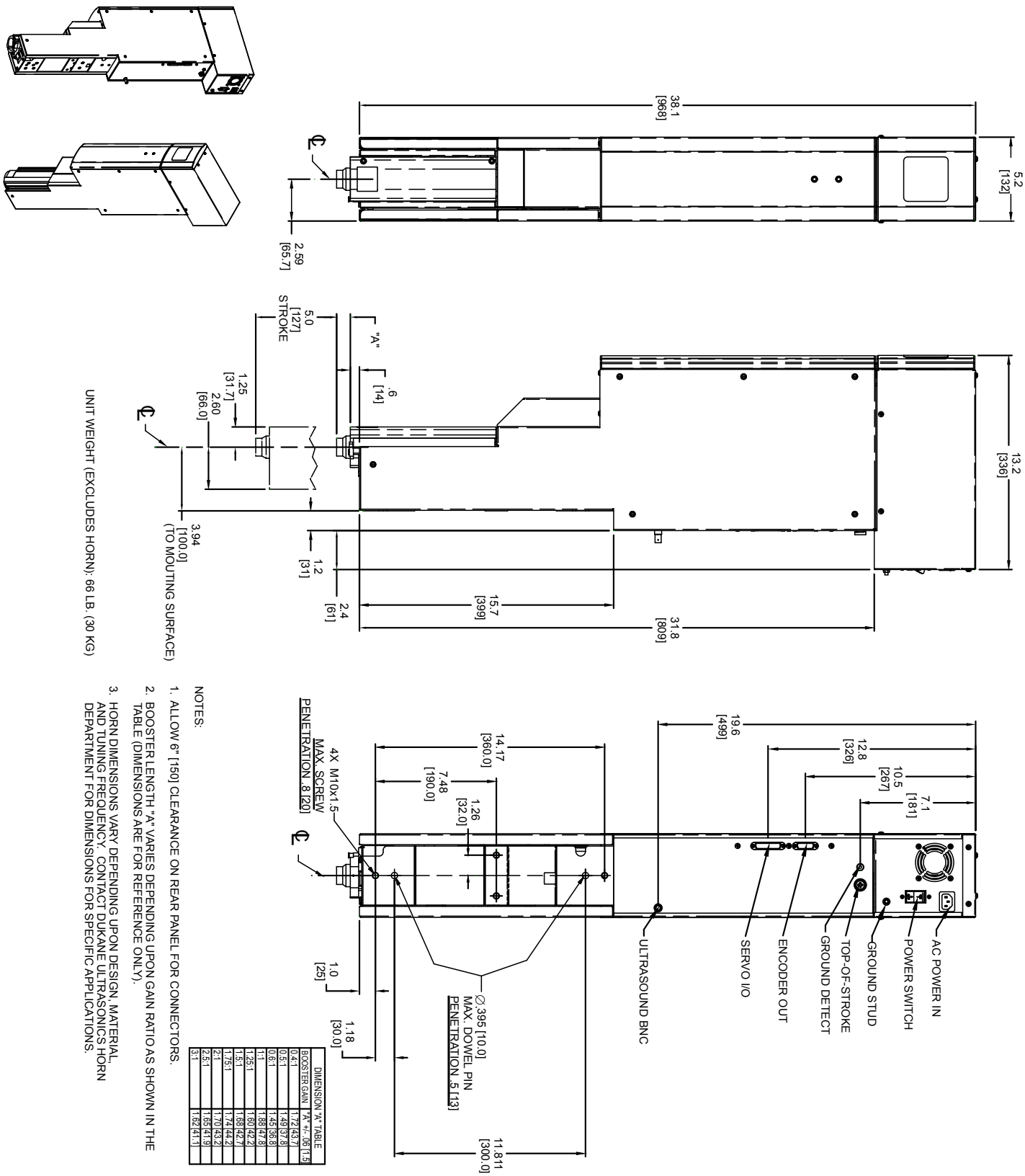


Figure 11-5 Layout - 20 kHz *iQ* Servo Press System - Drawing 400-2295



NOTES:

1. ALLOW 6" [150] CLEARANCE ON REAR PANEL FOR CONNECTORS.
2. BOOSTER LENGTH "A" VARIES DEPENDING UPON GAIN RATIO AS SHOWN IN THE TABLE (DIMENSIONS ARE FOR REFERENCE ONLY).
3. HORN DIMENSIONS VARY DEPENDING UPON DESIGN, MATERIAL, AND TUNING FREQUENCY. CONTACT DUKANE ULTRASONICS HORN DEPARTMENT FOR DIMENSIONS FOR SPECIFIC APPLICATIONS.

DIMENSION "A" TABLE	
BOOSTER GAIN	"A" +/- .06 [1.5]
0.4:1	1.72 [43.7]
0.5:1	1.49 [37.8]
0.6:1	1.45 [36.8]
1:1	1.38 [47.8]
1.25:1	1.60 [42.2]
1.5:1	1.68 [42.7]
1.75:1	1.74 [44.2]
2:1	1.70 [43.2]
2.5:1	1.65 [41.9]
3:1	1.62 [41.1]

Figure 11-6 Layout - 30/40 kHz *iQ* Servo Thruster 43S340 - Drawing 400-1978

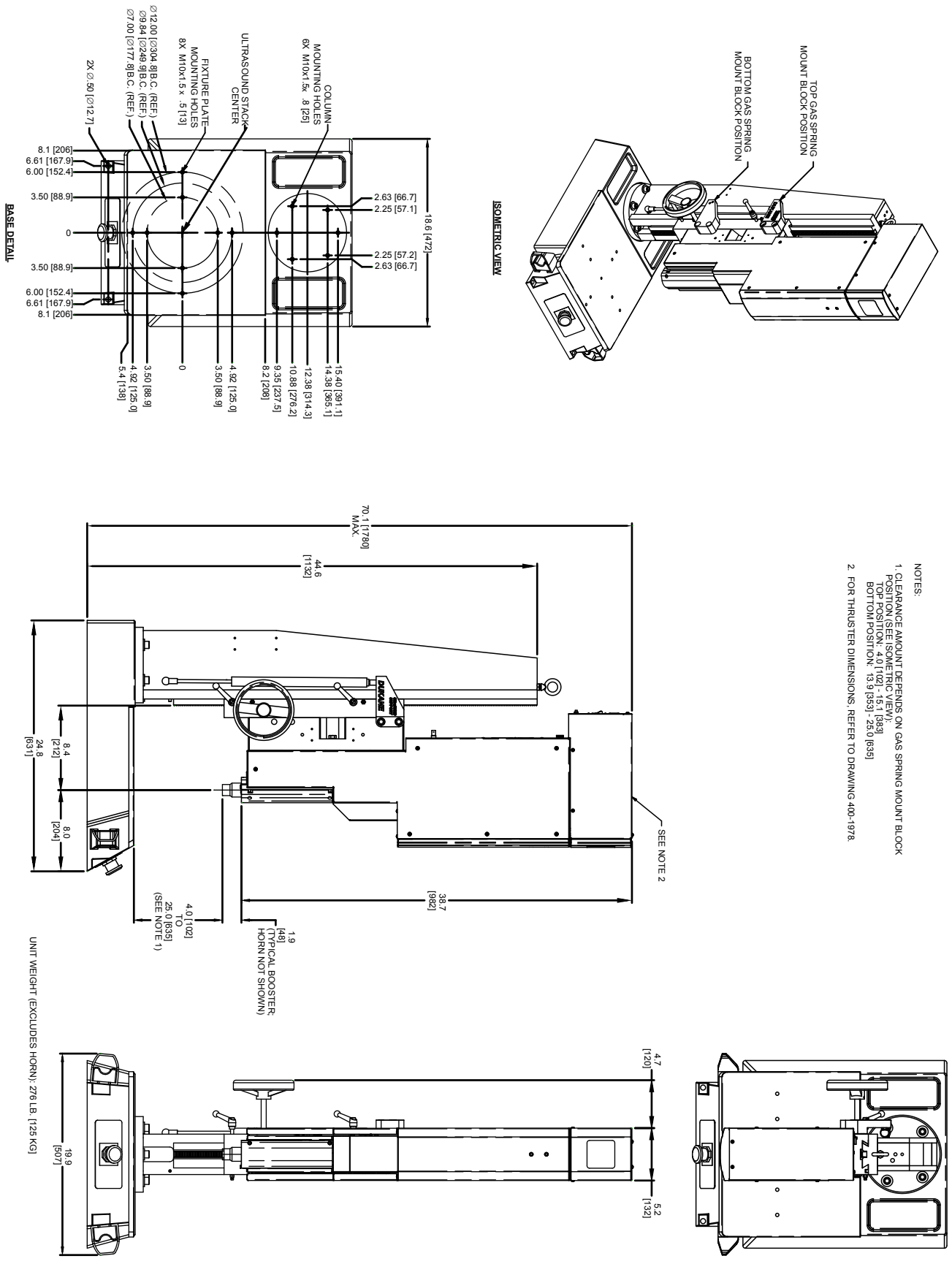


Figure 11-7 Layout - 30/40 kHz ***iQ*** Servo Press System - Drawing 400-2090

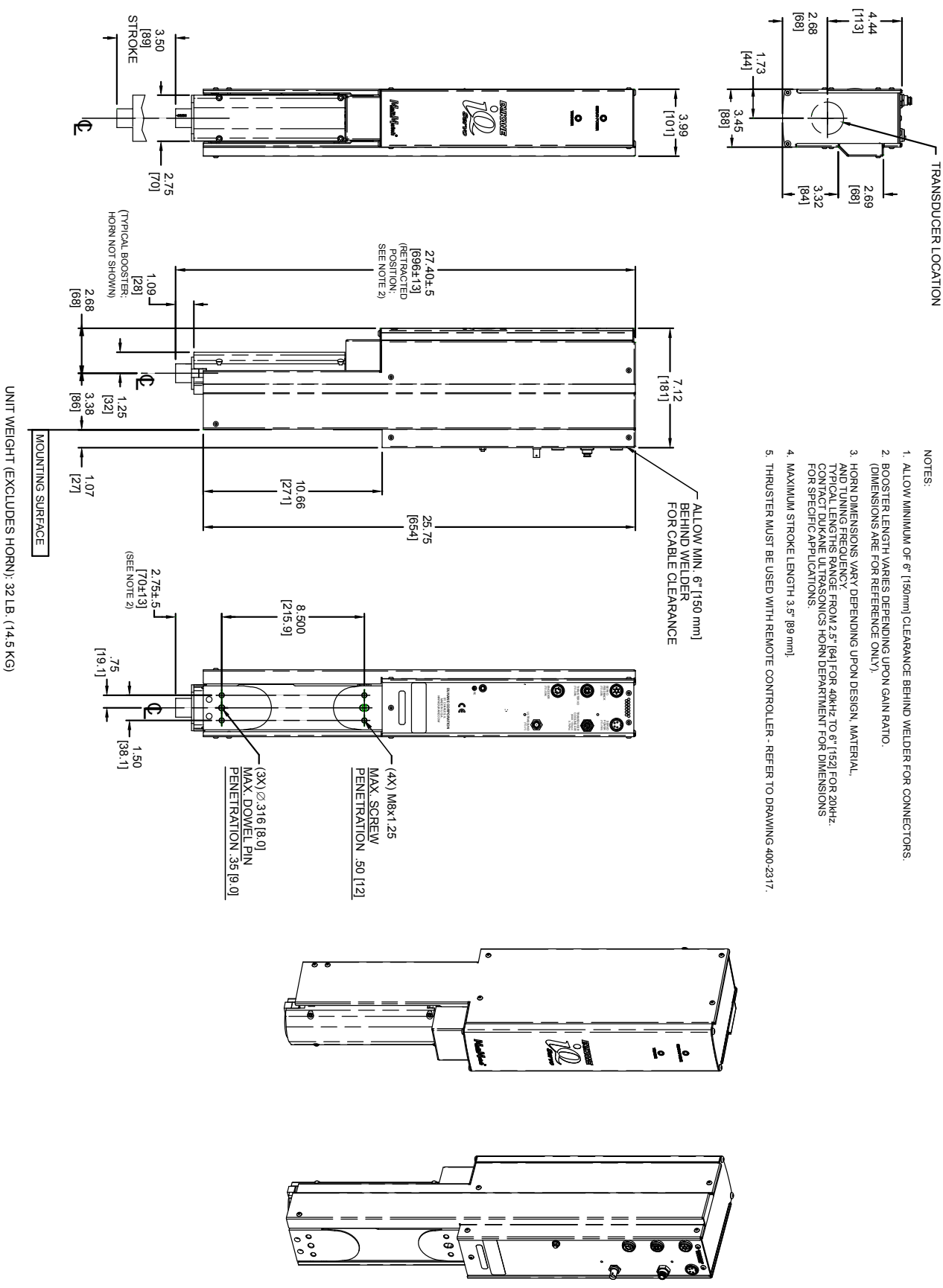

TRANSDUCER LOCATION
4.44 [113]
2.68 [68]
1.73 [44]
3.45 [88]
2.69 [68]
3.32 [84]
3.50 [89] STROKE
3.99 [101]
2.75 [70]
(TYPICAL BOOSTER; HORN NOT SHOWN)
1.09 [28]
2.68 [68]
27.40±.5 [696±13] (RETRACTED POSITION; SEE NOTE 2)
7.12 [181]
1.25 [32]
3.38 [86]
MOUNTING SURFACE
1.07 [27]
10.66 [271]
25.75 [654]
ALLOW MIN. 6" [150 mm] BEHIND WELDER FOR CABLE CLEARANCE
2.75±.5 [70±13] (SEE NOTE 2)
8.500 [215.9]
.75 [19.1]
1.50 [38.1]
(3X) ∅.316 [8.0] MAX. DOWEL PIN PENETRATION .35 [9.0]
(4X) M8x1.25 MAX. SCREW PENETRATION .50 [12]
UNIT WEIGHT (EXCLUDES HORN): 32 LB. (14.5 KG)
NOTES:
1. ALLOW MINIMUM OF 6" [150mm] CLEARANCE BEHIND WELDER FOR CONNECTORS.
2. BOOSTER LENGTH VARIES DEPENDING UPON GAIN RATIO. (DIMENSIONS ARE FOR REFERENCE ONLY).
3. HORN DIMENSIONS VARY DEPENDING UPON DESIGN, MATERIAL, AND TUNING FREQUENCY. TYPICAL LENGTHS RANGE FROM 2.5" [64] FOR 40kHz TO 6" [152] FOR 20kHz. CONTACT DUKANE ULTRASONICS HORN DEPARTMENT FOR DIMENSIONS FOR SPECIFIC APPLICATIONS.
4. MAXIMUM STROKE LENGTH 3.5" [89 mm].
5. THRUSTER MUST BE USED WITH REMOTE CONTROLLER - REFER TO DRAWING 400-2317.

Figure 11-8 Layout - 30/40 kHz Mini Servo Thrusters 43S245-A2 and 43S245-A4 - Drawing 400-2316

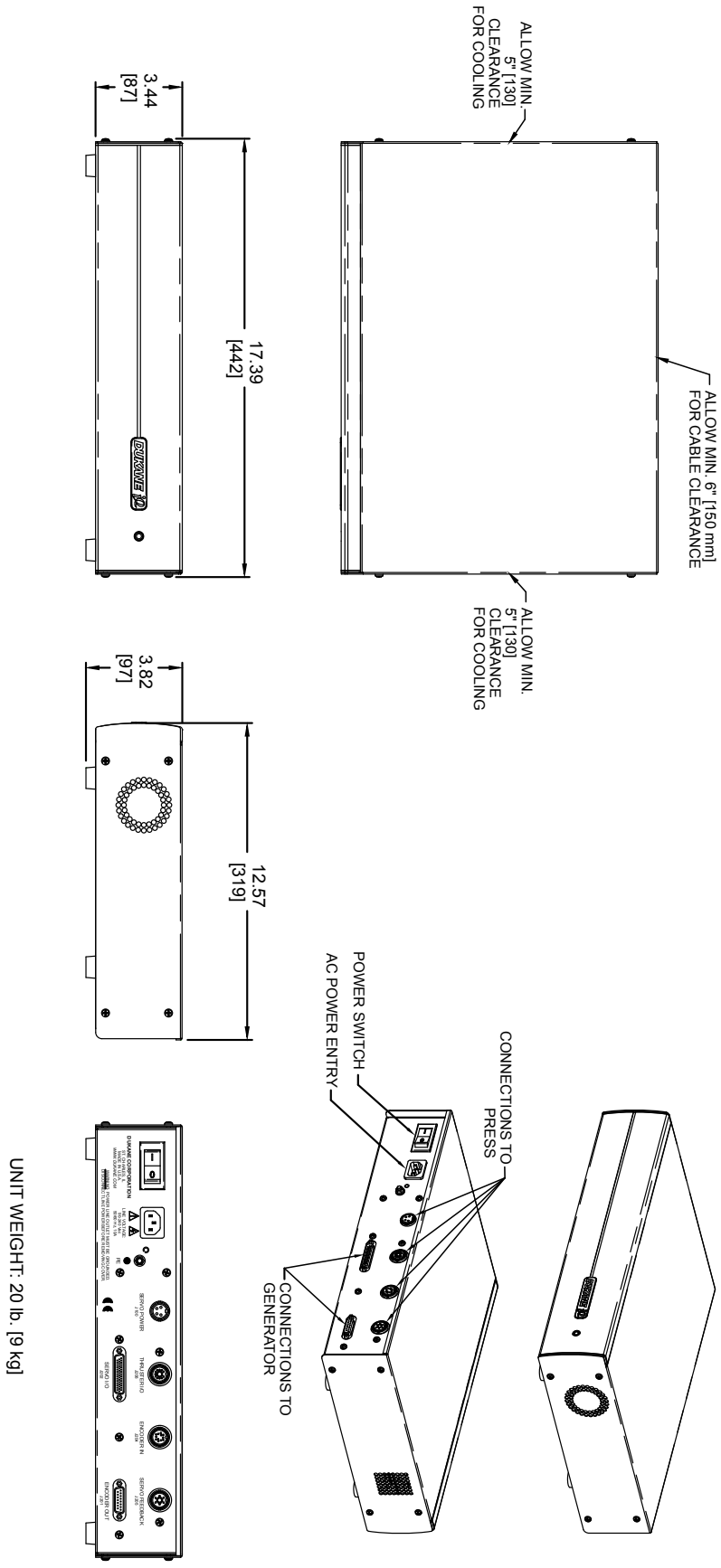

ALLOW MIN. 5" [130] CLEARANCE FOR COOLING
ALLOW MIN. 6" [150 mm] FOR CABLE CLEARANCE
ALLOW MIN. 5" [130] CLEARANCE FOR COOLING
3.44 [87]
17.39 [442]
3.82 [97]
12.57 [319]
POWER SWITCH AC POWER ENTRY
CONNECTIONS TO PRESS
CONNECTIONS TO GENERATOR
UNIT WEIGHT: 20 lb. [9 kg]

Figure 11-9 Layout - 30/40 kHz Mini Servo Remote Controller 43R245 - Drawing 400-2317

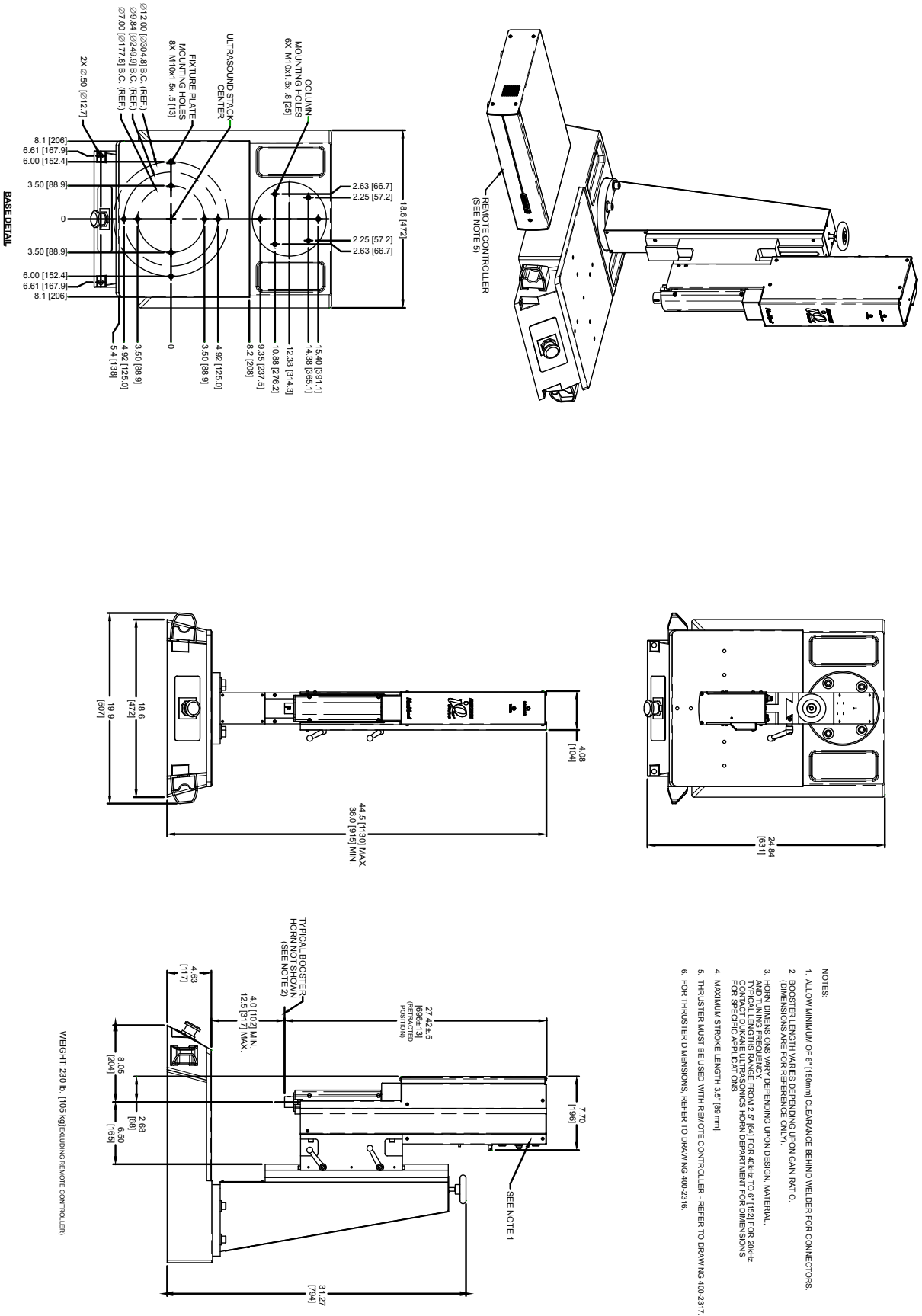


Figure 11-10 Layout - 30/40 kHz Mini Servo Press System - Drawing 400-2318

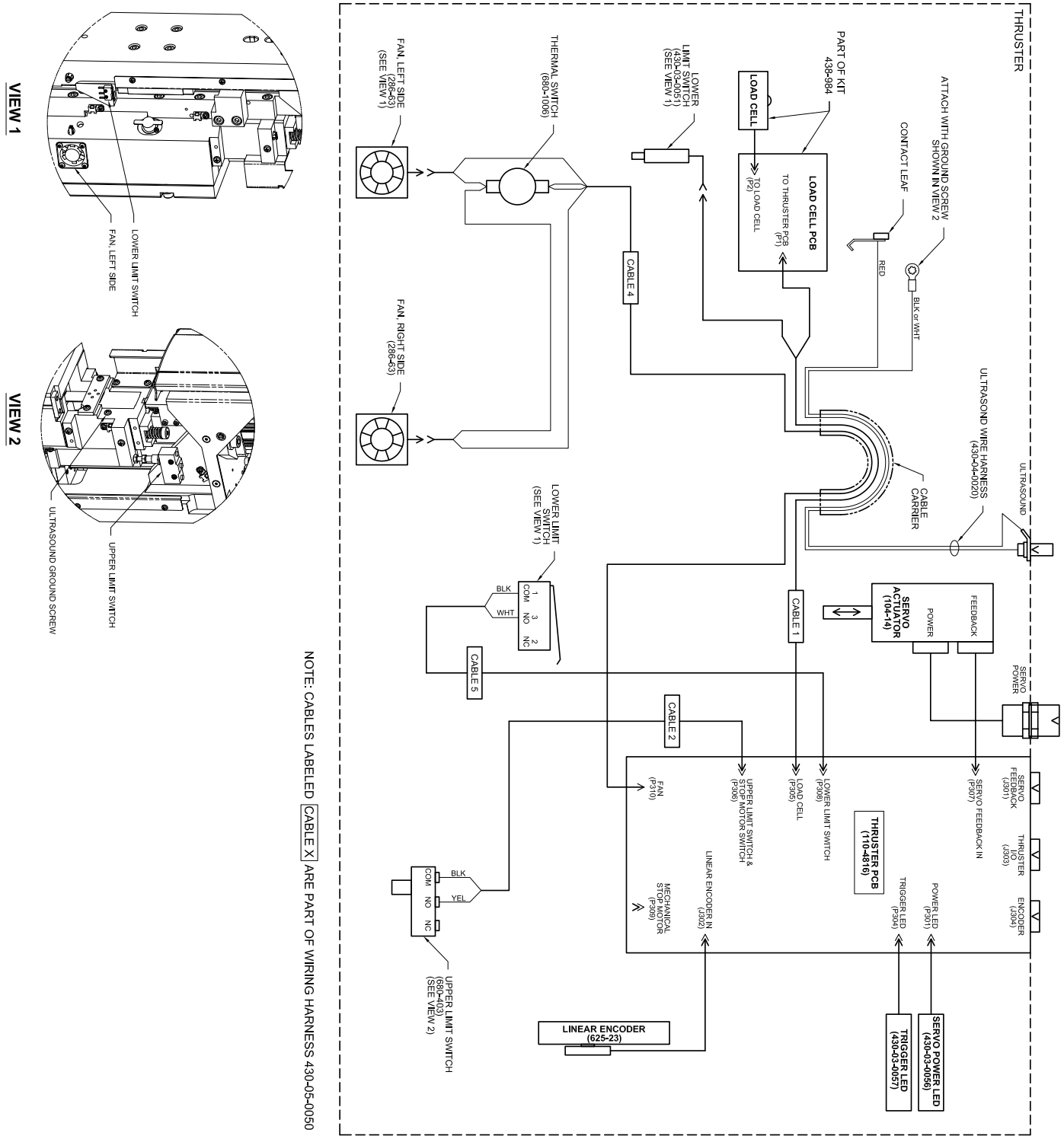
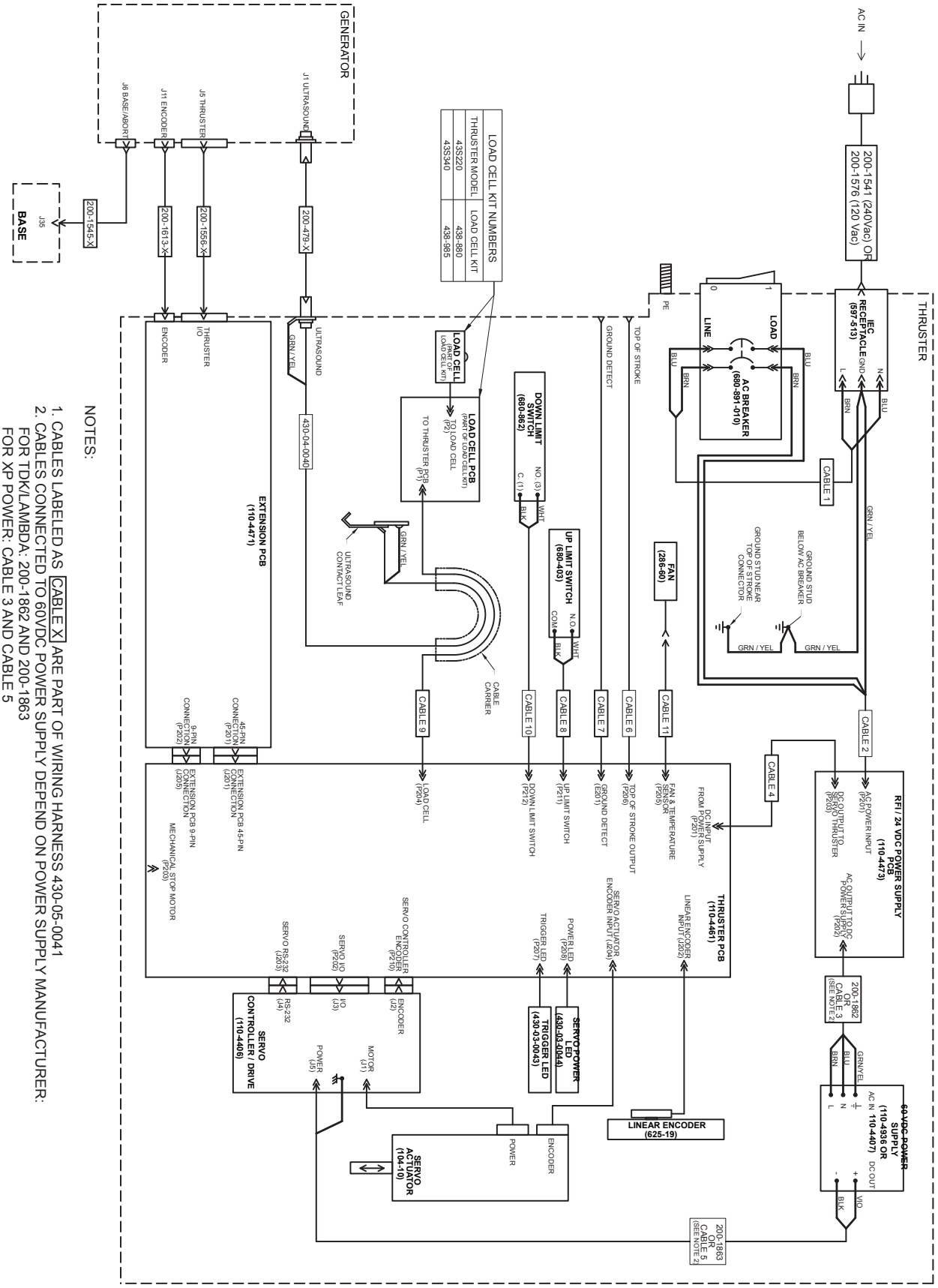


Figure 11-11 Press Wiring Diagram - Model 43S215



NOTES:

1. CABLES LABELED AS CABLE X ARE PART OF WIRING HARNESS 430-05-0041
2. CABLES CONNECTED TO 60VDC POWER SUPPLY DEPEND ON POWER SUPPLY MANUFACTURER:
   FOR TDK/LAMBDA: 200-1862 AND 200-1863
   FOR XP POWER: CABLE 3 AND CABLE 5

Figure 11-12 Layout - Press Wiring Diagram - Models 43S220 and 43S340 - Drawing 190-3867

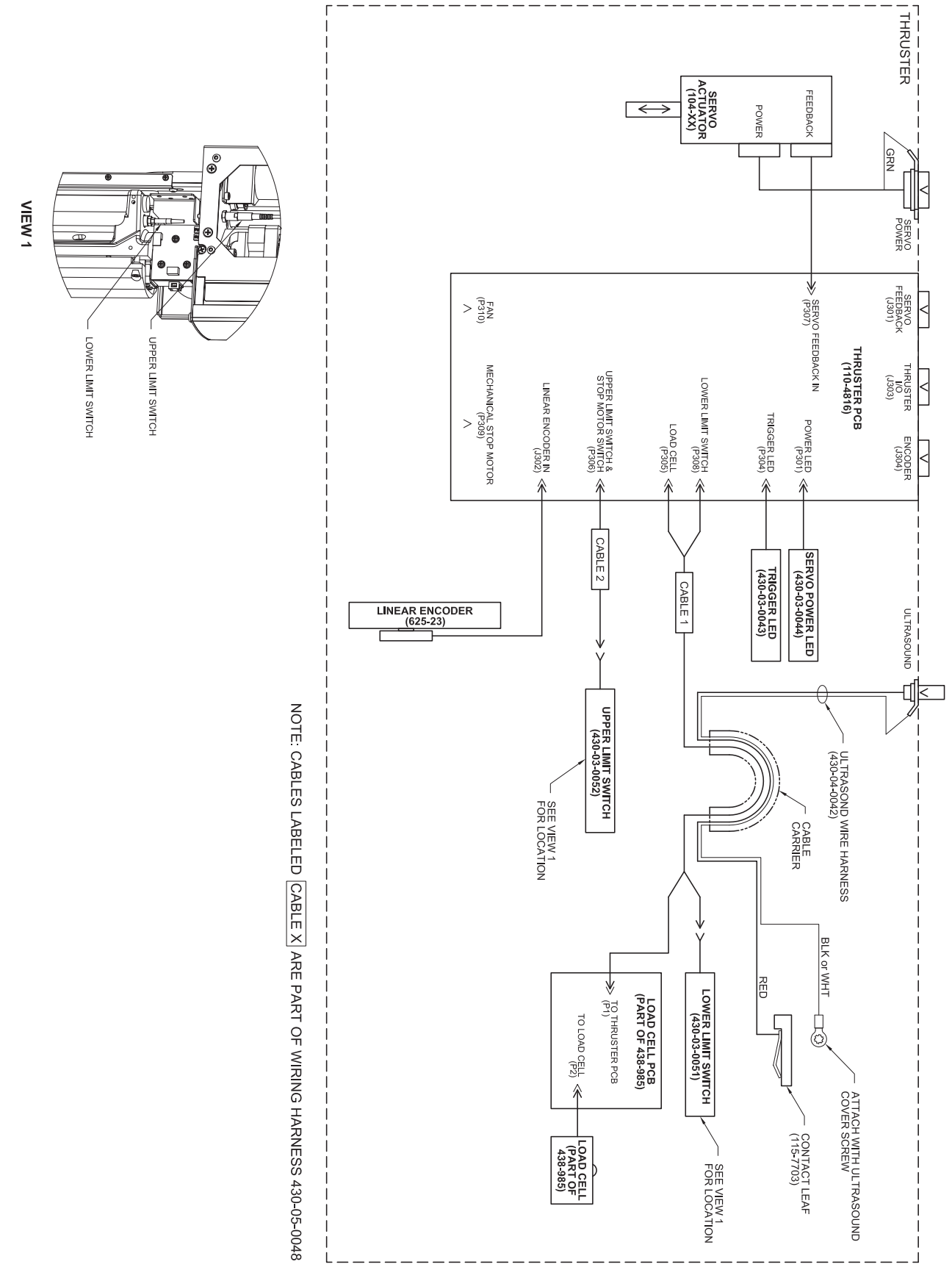


Figure 11-13 Press Wiring Diagram - Models 43S245A and 43S245-A4

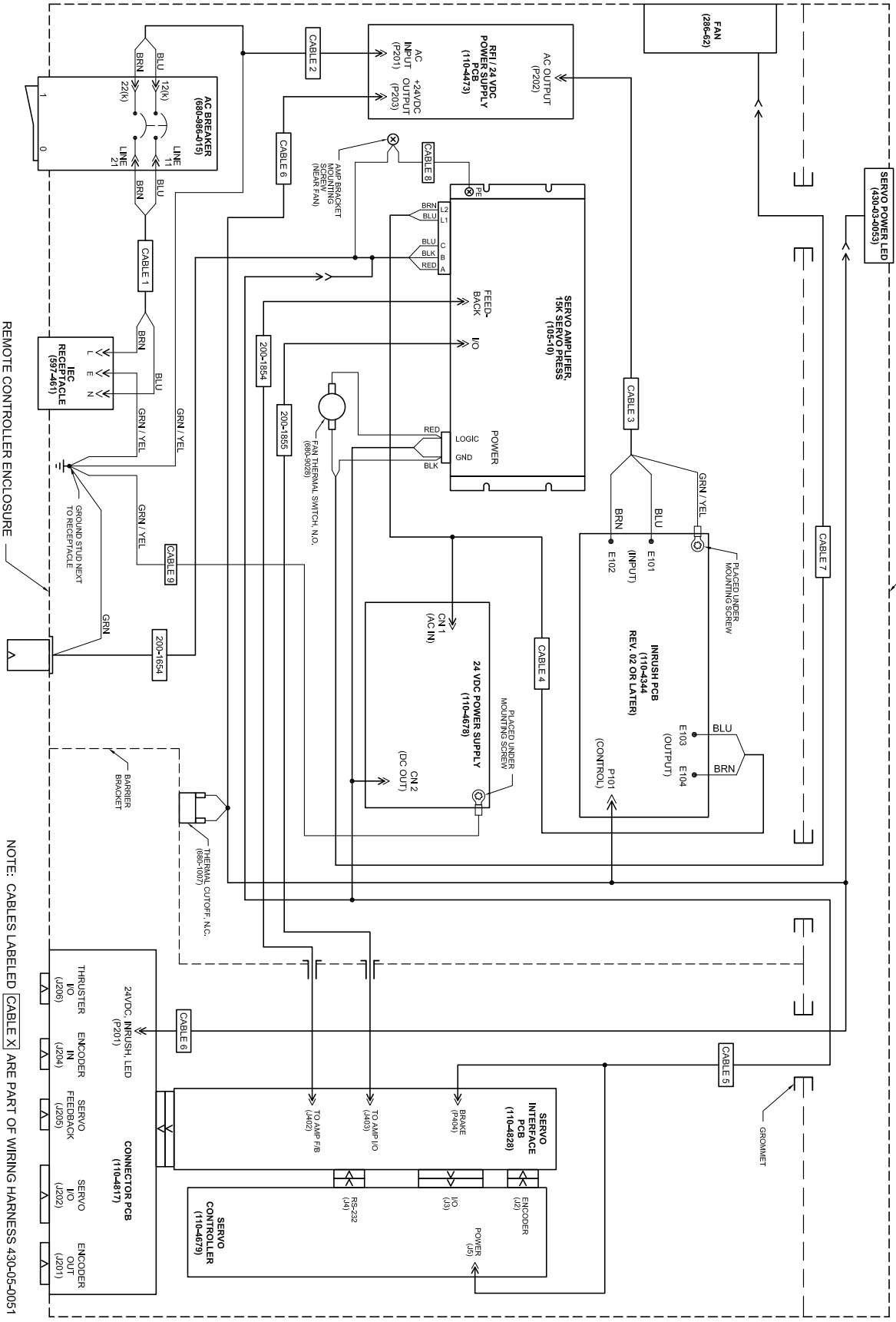


Figure 11-14 Remote Controller Wiring Diagram - Model 43R215

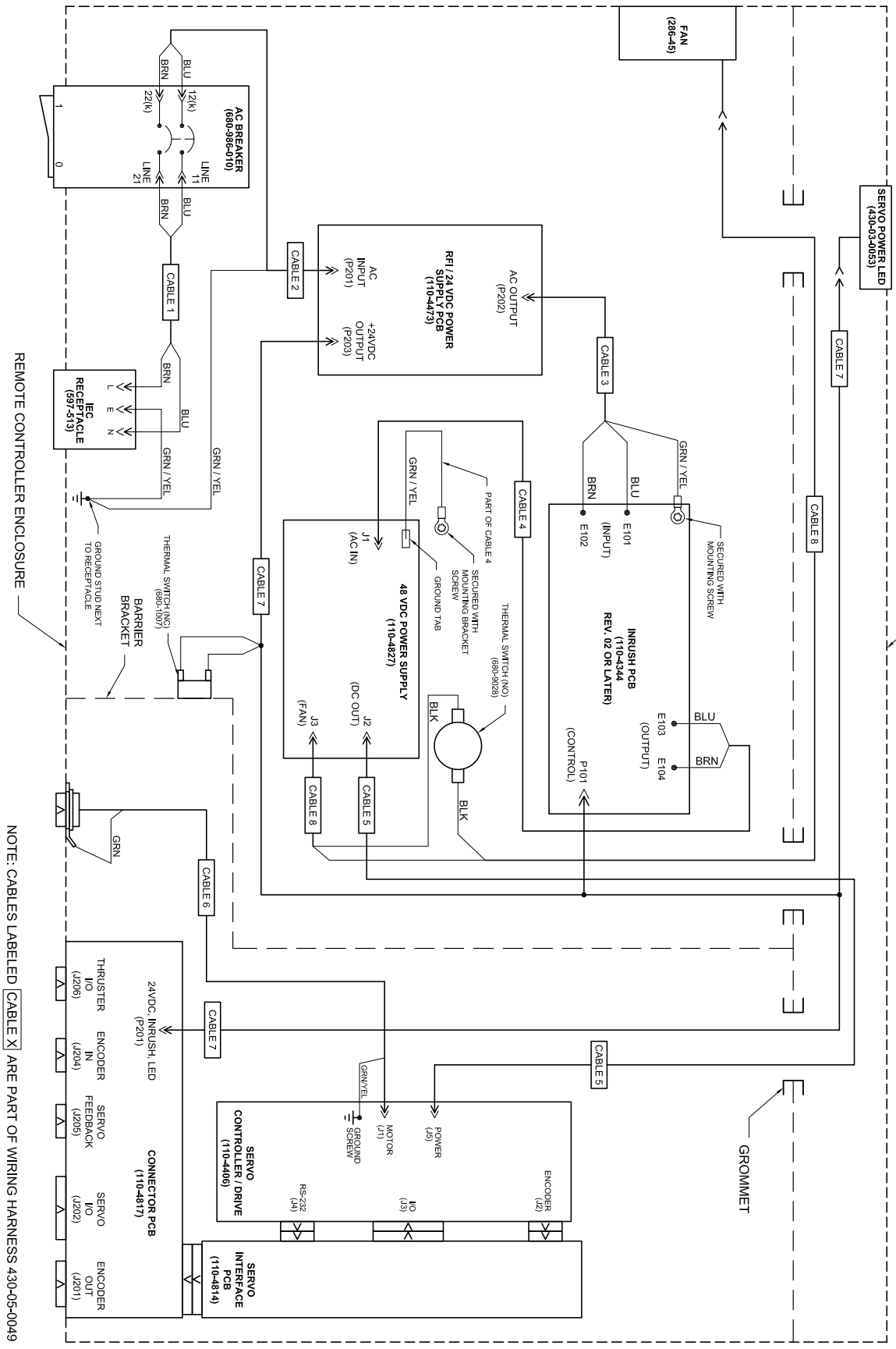


Figure 11-15 Remote Controller Wiring Diagram - Model 43R245

Replacement Parts - iQ Series Servo Presses ES

Below is a list of select replacement parts. Contact Dukane for any parts not listed here.

Part Number	Part Description	Press Model				
		43S215 with 43R215	43S220	43S245-A2 with 43R245	43S245-A4 with 43R245	43S340
110-4675	Servo actuator with mount plate	X	—	—	—	—
110-4551	Servo actuator with mount plate	—	X	—	—	—
110-4820	Servo actuator with mount plate	—	—	X	—	—
110-4824	Servo actuator with mount plate	—	—	—	X	—
110-4612	Servo actuator with mount plate	—	—	—	—	X
110-4679	Servo motor controller (1)	X	—	—	—	—
110-4406	Servo motor controller (1)(2)	—	X	X	X	X
105-10	Servo amplifier (1)	X	—	—	—	—
110-4407	Power supply for servo controller	—	X	—	—	X
110-4827	Power supply for servo controller	—	—	X	X	—
110-4678	Power supply for servo drive	X	—	—	—	—
625-19	Optical distance encoder	X	X	—	—	X
625-23	Optical distance encoder	—	—	X	X	—
438-984	Load cell kit (3)	X	—	—	—	—
438-880	Load cell kit (3)	—	X	—	—	—
438-985	Load cell kit (3)	—	—	X	X	X

Table 11-VII Select Replacement Parts

X = available
— = unavailable

NOTES:

(1) Component requires programming at the factory.

(2) Please specify Press Model number at time of order.

(3) Load cell requires calibration after installation into press.

Regulatory Agency Compliance

FCC

The generator complies with the following Federal Communications Commission regulations.

- The limits for FCC measurement procedure MP-5, "Methods of Measurement of Radio Noise Emissions from ISM Equipment", pursuant to FCC Title 47 Part 18 for Ultrasonic Equipment.

CE Marking

This mark on your equipment certifies that it meets the requirements of the EU (European Union) concerning interference causing equipment regulations. CE stands for Conformité Europeéne (European Conformity). The equipment complies with the following CE requirements.

- The EMC Directive 2004/108/EC for Heavy Industrial —
  EN 61000-6-4: 2001
  EN 55011: 2003
  EN 61000-6-2: 2005
  EN61000–4–2
  EN61000–4–3
  EN61000–4–4
  EN61000–4–5
  EN61000–4–6
  EN61000–4–8
  EN61000–4–11
- The Low Voltage Directive 2006/95/EC.
- The Machinery Directive 2006/42/EC.
  EN 60204: 2006
  Safety of Machinery - Electrical Equipment of Machines Part 1: General Requirements.

IP (International Protection) Rating

The ***iQ*** generator as well as all models of the servo press and remote controller have an IP rating from the IEC (International Electrotechnical Commission). The rating is IP2X, in compliance with finger-safe industry standards.

CAUTION

DO NOT make any modifications to the generator, press, remote controller or associated cables as the changes may result in violating one or more regulations under which this equipment is manufactured.

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Appendices

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Dukane ISO

ISO CERTIFICATION

Dukane chose to become ISO 9001:2008 certified in order to demonstrate to our customers our continuing commitment to being a quality vendor. By passing its audit, Dukane can assure you that we have in place a well–defined and systematic approach to quality design, manufacturing, delivery and service. This certificate reinforces Dukane's status as a quality vendor of technology and products.

To achieve ISO 9001:2008 certification, you must prove to one of the quality system registrar groups that you meet three requirements:

1. Leadership
2. Involvement
3. Quality in Line Organizations and Quality System Infrastructure.

The ISO 9001:2008 standard establishes a minimum requirement for these requirements and starts transitioning the company from a traditional inspection–oriented quality system to one based on partnership for continuous improvement. This concept is key in that Dukane no longer focuses on inspection, but on individual processes.

Dukane's quality management system is based on the following three objectives:

1. Customer oriented quality. The aim is to improve customer satisfaction.
2. Quality is determined by people. The aim is to improve the internal organization and cooperation between staff members.
3. Quality is a continuous improvement. The aim is to continuously improve the internal organization and the competitive position.

ISO 9001:2008
CERTIFIED

Dukane products are manufactured in ISO registered facilities.

Please refer to our website at:

www.dukane.com/us/sales/intsales.htm

to locate your local representative.

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